SCIENTIFIC AMERICAN

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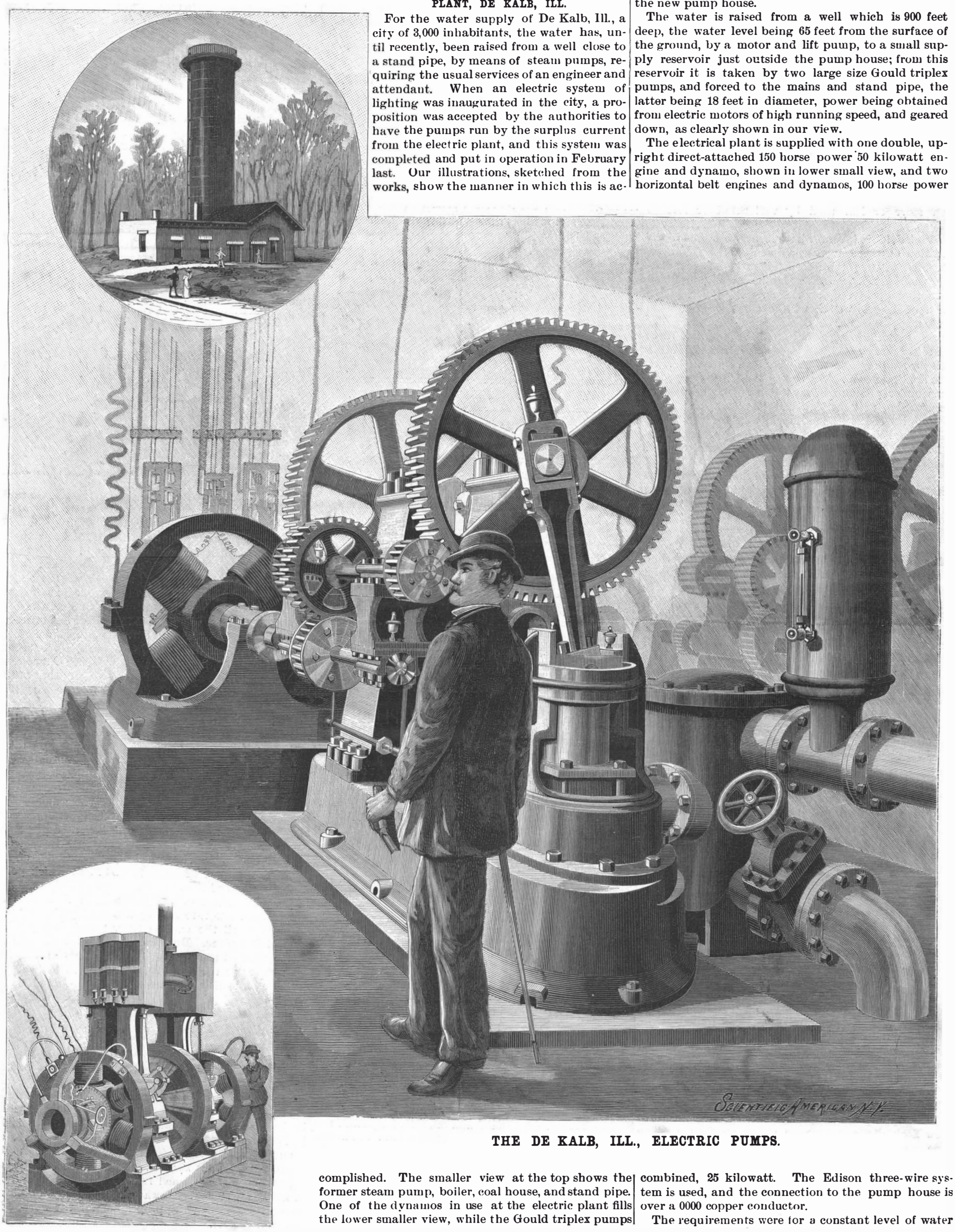
ELECTRICALLY OPERATED WATER SUPPLY PLANT, DE KALB, ILL.

For the water supply of De Kalb, Ill., a city of 3,000 inhabitants, the water has, until recently, been raised from a well close to a stand pipe, by means of steam pumps, requiring the usual services of an engineer and attendant. When an electric system of lighting was inaugurated in the city, a proposition was accepted by the authorities to have the pumps run by the surplus current from the electric plant, and this system was completed and put in operation in February last. Our illustrations, sketched from the works, show the manner in which this is accomplished. The smaller view at the top shows the former steam pump, boiler, coal house, and stand pipe. One of the dynamos in use at the electric plant fills the lower smaller view, while the Gould triplex pumps and motors are shown in the large general interior of the new pump house.



THE DE KALB, ILL., ELECTRIC PUMPS.

The water is raised from a well which is 900 feet deep, the water level being 65 feet from the surface of the ground, by a motor and lift pump, to a small supply reservoir just outside the pump house; from this reservoir it is taken by two large size Gould triplex pumps, and forced to the mains and stand pipe, the latter being 18 feet in diameter, power being obtained from electric motors of high running speed, and geared down, as clearly shown in our view.

The electrical plant is supplied with one double, upright direct-attached 150 horse power 50 kilowatt engine and dynamo, shown in lower small view, and two horizontal belt engines and dynamos, 100 horse power combined, 25 kilowatt. The Edison three-wire system is used, and the connection to the pump house is over a 0000 copper conductor.

The requirements were for a constant level of water

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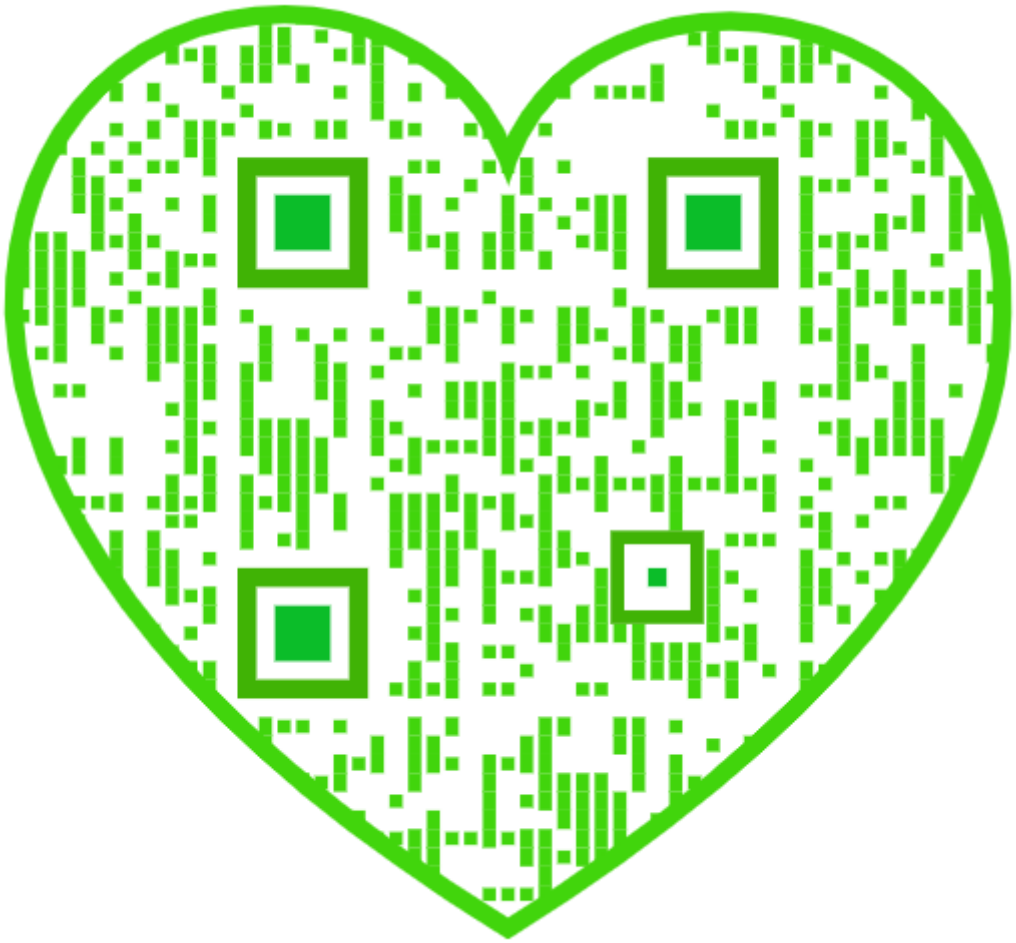

of 85 feet in the stand pipe, with an increased pressure in the mains in an emergency of fire, the increase of pressure being obtained by use of an automatic closing valve at the stand pipe, when a fire pressure was required. An ordinary pressure of 40 pounds is maintained in the mains for domestic service, and in case of fire the pressure is raised to 125 pounds.

The pump house shown is fully one-half mile from the electric plant, and the pumps are controlled entirely by means of a switch at the electric power house. The system has been found to meet all the requirements.

Corn Stalks and Cocoanut Husks.

In view of the great rapidity with which the modern rapid-fire guns can deliver shells, it has been felt for some time that, in addition to watertight subdivisions in war ships, other means of preventing any inflow of water should be used. The most favored method of accomplishing this result has been to fit a coffer dam, or double skin, for some distance above and below the water line, the space between being about three feet thick and filled with material which would expand and keep out water when a shot passed through. The material that was adopted in the United States navy for this purpose in 1892, called cellulose, is obtained from the husks of cocoanuts, being a brown, powdery substance, very light, and admitting of a good deal of compression. It was first used in France, and has been more or less used by various other foreign nations.

A Philadelphia inventor has recently brought to the attention of the Navy Department a new cellulose, composed of the pith of cornstalks which is granulated by machinery. Secretary Herbert has determined to thoroughly investigate the new substance, and a board of experts was appointed a few weeks ago to conduct experiments. This board had duplicate coffer dams constructed, measuring six feet square and three feet thick, one packed with cocoa fiber and the other with cornstalk cellulose. A six and an eight inch shell were fired into each. Water was then forced into the dams under pressure. The water failed to penetrate the Marsden or American cellulose dam, but oozed through the cocoa product in a short time.

The English battle ship Inflexible is protected by coffer dams filled with a mixture of cork and oakum, which aggregates in weight 143 tons. With the French cocoa cellulose this weight would be reduced to 43 tons, while the American corn product would not weigh over 25 tons and furnish, it is claimed, more reliable protection.

Photography in Natural Colors.

A. and L. Lumiere point out that the indirect method of photographing in natural colors has not received a proper practical application, because of the difficulty experienced in selecting the colors and in preparing and superposing the monochromes. They recommend the use of orange, green and violet screens for preparing three series of negatives presenting a maximum of sensibility to the rays which the respective screens allow to pass. Specimens of photographs so prepared were exhibited before the Paris Academy of Sciences. The printing and superposition of the monochromes have been successfully accomplished by employing bichromated gelatine to which are added substances insoluble under certain conditions. If, for example, 5 per cent of ammonium bichromate and 5 to 10 per cent of silver bromide in the form of emulsion be added to a 10 per cent solution of gelatine, and the preparation be spread in a thin layer upon a plate of glass, a surface is obtained which can be exposed under a negative and will reproduce the picture by the action of light. After exposure the plate is washed with cold water, and the portion of the film acted upon by light, being rendered insoluble, remains and serves to print the image from on the application of suitable colors. The sliver bromide, which, by the way, may be replaced by other insoluble precipitates, is easily removed by the action of sodium hyposulphite, and proofs can then be printed from the plate in any color, showing all the graduations of tint present in the negative. Polychrome prints may be obtained by receiving on the same plate monochrome red, yellow and blue images successively, by means of three corresponding negatives, and isolating each image from the preceding one by an impervious layer of collodion. By employing dyes of greater or less concentration or by simple decoloration with water, variation in the relative intensity of the monochromes is readily obtained.—Comp. Rend.

THE proprietors of the New York Recorder recently offered a prize for a relay bicycle race from Chicago to New York, distance by road about 1,000 miles. The race was finished on the 8th inst., time 64 hours 57 minutes and 30 seconds. A crowd of 10,000 persons gathered at the Metropolitan Bicycle Academy, corner 60th Street and Boulevard, New York, to witness the coming in of the two riders, the red and the blue. The finish took place at 1:57 A. M., when the red rider came in about an hour ahead of the blue.

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NEW YORK, SATURDAY, JUNE 29, 1895.

Contents.

(Illustrated articles are marked with an asterisk.)

Ash sifter, Briner's*..... 404
Artesian well, oil, gas, and water from..... 407
Bicycler's distance recorder*..... 405
Bicycle, the 409
Bonaparte and the refractometer 403
Books and publications, new..... 411
Botanical garden, the New York 405
Brake slack adjuster, Freese & Nicholson's*..... 405
Bursting of a cream separator... 409
Cable, Atlantic, projectors of the* 408
Canal, Harlem, opening*..... 409
Canal, ship, Block Island..... 402
Cellulose for skins of vessels.... 402
Clearing House, N. Y., vault..... 403
Clothes wringers (6560) 411
Cotton crop, the, of 1895..... 407
Electrically operated pumps*.... 401
Electrical notes..... 407
Franklin, Benjamin, on torpedo fish..... 407
French inhumanity..... 409
Glass, silvering..... 407
Hair curler, Brand's*..... 404
Ignorance not a legal defense.... 403
Insects and flowers..... 410
Inventions, recently patented... 411
Kiel Canal celebration, the, in Germany..... 402
Lakes, temperature of..... 402
Lead wort, the..... 404
Lens, the great Yerkes, testing. 409
Life, long, secret of..... 403
Loading an ocean steamer..... 410
Lubrication, uneconomical..... 403
Notes and queries..... 411
Odometer, the Bell*..... 405
Organ of steamer St. Louis..... 408
Patent decisions of the courts.. 403
Patents granted, weekly record. 412
Photography in natural colors.. 402
Piano action frame, Bothmer's*. 404
Plow, faults of the..... 410
Power, cost of, at Niagara..... 407
Rifle, the Blake repeating*..... 406
Steam trap, the Bundy*..... 405
Street car fenders..... 406
Sweeper, street car, Waite's*.... 404
Tanning, quebracho for*..... 404
Water supply, DeKalb, Ill.*..... 401
Welding, electric 407
Wheel, the, how to ride..... 406
Yellowstone Park falls and geysers*..... 408

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 1017.

For the Week Ending June 29, 1895.

Price 10 cents. For sale by all newsdealers.

PAGE

I. CHEMISTRY.—Detection of Blood Spots in Presence of Rust.—By Herren MECKE and WIMMER.—An important contribution to the literature of medical jurisprudence..... 16258
The Production of Diastase and of an Alcoholic Ferment from Fungi.—This important discovery is due to a Japanese chemist named Jokichi Takamine..... 16252

II. CIVIL ENGINEERING.—The Boston Electric Railway Subway.—A description of this important engineering work, which will extend from the Fitchburg Railway Station to the Public Garden, and will relieve the streets of this congested district.—With profiles and cross sections of the subway.—The total cost of the improvement will be about $5,000,000.—The article includes a map and view of one of the stations.—10 illustrations..... 16254
The Chicago Drainage Canal.—A description of this great engineering work, from its inception to the present time.—The estimated cost of this work is $21,799,203.—It will be completed about November 1, 1896.—The article gives illustrations of graders, derricks, cantilevers, and hoisting machinery.—9 illustrations..... 16248
The Effects of the Canal on the Commerce of the Lakes.—This article includes the estimates of the amount that the canal will probably lower the lake level and the damage that would result thereby to the commerce of the lakes..... 16248

III. ELECTRICITY.—The Iodine Voltameter.—A full description of the new and delicate form of voltameter, which is especially valuable for weak currents..... 16253

IV. MECHANICAL ENGINEERING.—The Old and the New.—By ROBERT ALLISON.—A paper presented at the Detroit meeting (June, 1895) of the American Society of Mechanical Engineers.—Includes a discussion by Mr. Samuel Webber and others, containing many reminiscences of old tools and methods of practice..... 16238
Rustless Coatings for Iron and Steel.—Paints.—Of what composed, how destroyed, classification as true pigments and inert substances, adulterants, etc.—By P. M. WOOD.—An important paper, giving the results of many experiments on the protection of iron and steel, including natural and artificial asphalt coatings... 16250

V. METALLURGY.—The Rarer Metals and Their Alloys.—Continuation of Professor Roberts-Austen's valuable lecture read at the Royal Institution.—This installment takes up the subject of armor plates and attack of projectiles, and the preparation for the microscope of diamonds and other forms of carbon obtained from carbonized iron.—5 illustrations..... 16256

VI. MINERALOGY.—Corundum Deposits of Georgia..... 16258

VII. NATURAL HISTORY.—The Action of Light on Animal Life.—The present article discusses the question of whether sunshine increases or diminishes an animal's susceptibility to disease..... 16258

VIII. PHOTOGRAPHY.—Binocular Photomicrography.—By Hon. A. A. ADEE.—Contains the result of a series of interesting experiments..... 16255

IX. PHYSICS.—Breath Figures.—By Dr. J. G. MCPHERSON, F.R.S.E.—Interesting paper on this curious phenomenon.—Gives a number of examples.—No one, as yet, has clearly explained how these impressions are produced by heat and electricity..... 16253

THE CELEBRATION IN GERMANY.

The ship canal recently opened across the northern peninsula of Germany was celebrated with rejoicings and festivities by the people of that great empire. On the invitation of the Emperor the representatives of the leading foreign governments took part; England, France, Russia and Italy sent some of their greatest war ships. The naval pageant was very grand. It is gratifying to know that the United States was represented by four such noble vessels as the Columbia, the New York, the San Francisco and the Marblehead. Report says the American ships presented a more attractive appearance and excited more interest than any of the assembled fleets, due, no doubt, to the white color of our ships, their clean and graceful lines.

The new canal, while it is a work of high importance to Germany as a means of defense in time of war, and of special commercial advantage in time of peace to her, to England and other nations of Northern Europe, is likely to be of little utility for ships of the United States. Seldom, probably, will American vessels have occasion to use the canal. Yet a stranger might have supposed, from the ringing cheers and enthusiastic demonstrations of the populace, as the Marblehead came into view and passed from town to town, bearing the star spangled banner through the windings of the canal, that Germany considered the Americans as holding the greatest interests, next to themselves, in the success and operations of the new waterway. Doubtless it was the presence of the glorious old flag, the symbol of free institutions, under which so many Germans, so many of their own kindred, live and prosper, under which so many of them have fought and died, that roused their feelings and caused their acclamations. Next to the emblem of the Fatherland, no ensign is so dear to the German heart as the flag of the American Union.

TEMPERATURES OF LAKES.

Mr. Desmond Fitz Gerald, at the annual meeting of the American Society of Civil Engineers at Nantasket, June 18 to 22, read an interesting paper on the temperature of lakes, based on experiments made by him during the past five years. The author deduced from his observations that in lakes and ponds less than 25 feet in depth the temperature at the bottom does not differ materially from that at the surface. In deeper bodies of water, however, the conditions are quite different. Experiments made on Lake Cochituate, the base of the Boston water supply, showed that when the surface is frozen during the winter the temperature at the bottom is usually 39·2 degrees. The strata of water lie in the order of their densities, and the temperature decreases gradually until within a few feet of the surface, when it suddenly falls to a point just above freezing. The disposition of the strata is not disturbed after the forming of the ice until the spring thaws. By April 1, the surface water has become warmed to the same temperature as that at the bottom, and, as the whole body is in more or less unstable equilibrium, the winds and currents are sufficient to produce circulation from top to bottom. This continues until the first of May, when the surface temperature has risen about five degrees above that of the bottom. The consequent difference in density prevents further circulation, and, while the warming of the surface continues, the temperature of the bottom remains stationary until the middle of November.

During this period the summer stagnation takes place. The lower layers of the water gradually collect all the organic matter from the upper layers, and decay continues until there is no more oxygen left to support it. At the same time the water grows darker and more impure until by October it is usually offensive to the smell and has a dull yellow color. About November 1 the temperature of the bottom begins to rise, until by the middle of the month it has increased from 20° to 30°, at which point it equals that of the surface.

The temperature of the whole mass then falls at nearly the same rate during a second period of circulation until the surface freezes and stratification again takes place. During the November circulation, and again in the spring to a less extent, all the impure water at the bottom is brought to the surface and the infusoria and diatoms spring into life in great numbers, owing to the union of the organic matter from the bottom with the oxygen in the surface water.

Block Island Ship Canal and Harbor.

The new canal connecting Great Salt Pond, on Block Island, with the ocean, has been practically completed by the Hartford Dredging Company. The canal makes an entrance with one of the finest land-locked harbors along the Atlantic coast. The width is 400 feet and the depth 14 feet. The distance excavated from water to water is 600 feet. Inside the lake the excavation extends 200 feet, and outside the ocean entrance has been deepened for 400 feet, making a total of 1,200 feet. The breakwater is 600 feet long. This year $50,000 has been appropriated for the work, and last year $25,000.

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Napoleon Bonaparte in Egypt and the Differential Refractometer at the Stevens Institute of Technology.

BY PRESIDENT HENRY MORTON, PH.D.

Now that so much is being said and published about Napoleon Bonaparte, it may interest our readers to know that in the physical cabinet of the Stevens Institute of Technology there is preserved a large piece of apparatus, the history of which, leading to its location as above, connects it with the grand though disastrous campaign in Egypt.

When Napoleon made his movement into Egypt he was accompanied by a number of prominent savants, members of the French Academy, who proceeded soon after their arrival to establish the French Academy of Egypt.

The most remarkable monument of their labors is found in the great work on Egypt, published by the French government, consisting of ten "elephant folios" of plates representing architectural monuments and inscriptions, as well as drawings of the fauna and flora of the country, and also comprising nine large octavo volumes of text.

At the same time they made arrangements for the pursuit of the higher lines of physical research, and for this purpose, among other things, ordered from the then famous instrument maker of Paris, J. Soleil, a piece of apparatus just devised by M. Arago, and called a differential refractometer.

However, before this apparatus was finished, Lord Nelson and the battle of Trafalgar intervened, and the address of the "French Academy of Egypt" became too uncertain to encourage the constructor in any attempt to deliver the instrument to those who had ordered it.

Under these circumstances, he looked around for another customer, and was glad to ship this apparatus —the largest of its kind ever built—to Mr. Charles Banker, of Philadelphia, who for many years had made it his pleasure to collect all sorts of philosophical apparatus, especially such as was unique and of special interest and value.

Mr. Banker had made during a long life, previous to 1870, a remarkable collection, filling several floors of a large dwelling house, and to this collection the present writer, for some years prior to that time, had almost exclusive access.

Mr. Banker died in 1870, without making any provision for keeping together his collection, and his executors offered it for sale. As the Stevens Institute of Technology was at that time about to begin its career, the present writer secured from the Banker collection all the most desirable objects, and among others this differential refractometer, whose original destination was Egypt.

Aside from these incidents of its early history, this apparatus is a remarkable one. It consists in the first place of a large and delicately adjustable vertical slot, through which light from the sun or other source may pass in a broad but thin vertical band or ribbon. This is received on a corrected lens which collimates or brings all rays into parallel lines, and then continues in two parallel portions, one traversiug a closed tube having flat glass ends while the other passes beside it through the free air, but being obliged likewise to pass through glass plates identical with those closing the ends of the tube.

This portion is about a yard in length. The two parallel portions of the light then pass each through a narrow vertical slit and then through adjustable plates of parallel glass and enter the object glass of a large telescope, through the eye piece of which they are viewed.

If the conditions to which each half of the divided ray is subjected are identical, a series of what are called diffraction bands will appear in certain well known positions; but if the conditions are varied, as, for example, by substituting some other gas for air in the closed tube, or by changing the density of the air in this tube, these bands will be seen to shift to the right or left and more or less according to the character and degree of the changes made.

These shiftings may be corrected by adjustment of the two plates of glass, the effect of whose refraction will vary with their inclinations to the rays, and the law of this action being known, the effect of the changes in nature or in density of the gas or air in the inclosed tube upon the velocity of light may be calculated.

So sensitive is this action that if a long rubber tube is connected with the opening into the brass tube and closed at its extremity, the minute change in density of the inclosed air produced by pinching the tube in one place will cause the bands of interference to move sideways the width of one band, and if the open end of the rubber tube is held opposite to and near the mouth while speaking, the bands will be seen to flutter by reason of the changes in density developed in the air by the act of speaking.

A USE for compressed air in the foundry in addition to cranes and hoists, which are being introduced everywhere, is in providing a sand blast for the cleaning of castings.

DECISIONS RELATING TO PATENTS.

Supreme Court of the United States.

EBY VS. KING ET AL.

Mr. Justice Brown delivered the opinion of the court.

Appeal from the Circuit Court of the United States for the Northern District of Illinois.

This was a bill in equity to recover damages for the infringement of reissued letters patent No. 7,851, granted August 21, 1877, to the plaintiff Eby, for an improvement in cob carriers for corn shellers.

Reissued letters patent No. 7,851, granted August 21, 1877, to Henry H. Eby for an improvement in cob carriers for corn shellers, Held to be void.

Where a reissue was obtained for the purpose of broadening the claims of the original patent to cover that which is presumed to have been once abandoned to the public, Held that the reissue is void. (White vs. Dunbar, 37 O. G., 1002; 119 U. S., 47; Ives vs. Sargent, 38 O. G., 781; 119 U. S., 652; Dunham vs. Dennison Mfg. Co., 67 O. G., 1571; 154 U. S., 103.)

When a patent has been surrendered and a reissue obtained and such reissue is held to be void, the patentee cannot proceed upon his original patent. (Moffitt vs. Garr, 1 Black, 273; Reedy vs. Scott, 7 O. G., 463; 23 Wall., 352, 364; Peck vs. Collins, 19 O. G., 1137; 103 U. S., 660; McMurray vs. Mallory, 27 O. G., 915; 111 U. S., 97, referred to and reviewed.)

The Commissioner is authorized to reissue patents in certain specified cases, and if the petition makes no pretense of setting forth facts entitling the patentee to a reissue, it is exceedingly doubtful whether he obtains any jurisdiction under section 4,916 Revised Statutes, to act upon such petition.

Supreme Court of the United States.

RICHARDS VS. CHASE ELEVATOR COMPANY.

Appeal from the Circuit Court of the United States for the Northern District of Illinois.

This was a bill in equity for the infringement of letters patent No. 308,095, issued November 18, 1884, to the plaintiff Richards for a grain transferring apparatus.

The claims of letters patent No. 308,095, issued November 18, 1884, to Edward S. Richards for a grain transferring apparatus, Held to be for a pure aggregation of old elements.

So long as each element performs some old and well-known function the result is not a patentable combination, but an aggregation of elements. The multiplicity of elements may go on indefinitely without creating a patentable combination, unless by their collocation a new result be produced.

While patent cases are usually disposed of upon bill, answer, and proof, there is no objection, if the patent be manifestly invalid upon its face, to the point being raised on demurrer and the case being determined upon the issue so formed. The Supreme Court has repeatedly held that a patent may be declared invalid for want of novelty, though no such defense be set up in the answer. (Dunbar vs. Myers, 11 O. G., 35; 94 U. S., 187; Slawson vs. Grand Street RR. Co., 24 O. G., 99; 107 U. S., 649; Brown vs. Piper, 10 O. G., 417; 91 U. S., 37.)

U. S. Circuit Court—Northern District of Illinois.

AMERICAN FIBER CHAMOIS COMPANY VS. DE LEE & DERNBERG.

Showalter, J.:

Trade Mark Valid.—The combined words "Fiber Chamois," as applied to a fabric used as an interlining for women's dresses, Held to have a significance as an arbitrary mark and name, whereby the goods made by complainant are identified and distinguished in the trade as carried on.

The Secret of Long Life.

M. Barthelemy Saint Hilaire, the famous French scholar and politician, who recently entered on his 90th year full of physical and intellectual vigor, has been telling the inevitable interviewer how it is his days have been so long in the land. It is, we are told, the effect of strict adherence to the old precept "early to bed and early to rise," with steady work during waking hours. Every grand old man seems to have a secret of his own. Mr. Gladstone, we believe, attributes his longevity to his habit of taking a daily walk in all weathers, and to his giving thirty-two bites to every morsel of food. Oliver Wendell Holmes pinned his faith on equability of temperature. The late Major Knox Holmes swore by the tricycle, which, in the end, was the cause of his death. Dr. P. H. Van der Weyde, an American octogenarian, not long ago offered himself "as an example of the benign influence of the study and practice of music." Some aged persons give the credit of their long lives to abstinence from tobacco, alcohol, meat, or what not; others to their indulgence in all these things. One old lady of whom we read not long ago as having reached the age of 120 or thereabout, maintained that single blessedness is the real elixir vitæ, and she ascribed the death of a brother at the tender age of 90 to the fact that he had committed matrimony in early life. M. Ferdinand de Lesseps believed in horse riding. Mr. James Payn complains that in his boyhood he "got a little bored with too much horse." The Grand Francais seemed to think that one can hardly have "too much horse." In a letter recently published, M. De Lesseps delivered himself on the subject as follows: "I shall always feel deeply grateful to Larine, my riding master, who from my earliest years made me share his keen passion for horses, and I am still convinced that daily horse exercise has in a large measure been the means of enabling me to reach my 84th year in perfect health." Carlyle was also a great rider almost to the end of his long life, and he not only rode, but, we believe, groomed his horse himself. On the whole, it must be concluded that the real secret of longevity is a sound constitution prudently husbanded. The only general rules that can be laid down are those set forth by Adam in "As You Like It":

> Though I look old, yet I am strong and lusty;
> For in my youth I never did apply
> Hot and rebellious liquors in my blood,
> Nor did not with unbashful forehead woo
> The means of weakness and debility;
> Therefore my age is as a lusty winter,
> Frosty but kindly.

That is the whole secret of long life. Shakespeare knew it as well as any one, yet he died at 52.—Br. Med. Jour.

Ignorance not a Valid Defense.

By a recent decision reported in the American Lawyer, a person who signs an instrument without reading it, when he can read, cannot, in the absence of fraud, deceit or misrepresentation, avoid the effect of his signature, because not informed of the contents of the instrument. The same rule would apply to one who cannot read, if he neglects to have it read, or to inquire as to its contents. This well settled rule is based upon the sufficient reason that in such cases ignorance of the contents of instruments is attributable to the party's own negligence. But the rule is otherwise where the execution of an instrument is obtained by a misrepresentation of its contents; where the party signed a paper he did not know he was signing, and did not really intend to sign. It is immaterial, in the latter aspect of the case, that the party signing had an opportunity to read the paper, for he may have been prevented from doing so by the very fact that he trusted to the truth of the representation made by the other party with whom he was dealing.

This is the clear-cut manner in which the Supreme Court of Alabama, in the case of Beck & Pauli Lithographing Co. v. Houppert et al. (16 So. Rep. 522), reiterates the wholesome doctrine that a person cannot take advantage of his own wrong or negligence.

Uneconomical Lubrication.

It is said that elaborate tests and investigations made a short time ago upon one of the largest railroads in the country showed that more than one-third of all the lubricating material supplied in a given time was wasted and lost by carelessness in handling, leakage, etc. A great deal of this waste oil is drawn from the journal boxes by the centrifugal force of the rapidly moving wheels and deposited upon the track. The ties and wooden bridges are injured and destroyed by being thus constantly soaked with oil, and are also rendered highly inflammable. These difficulties have led to the adoption of various kinds of solid or semi-solid grease in place of oil. A lubricant of this kind is now in use which seems to be all that could be wished, if the claims made for it are true. It is said that red hot iron will not burn it, water will not wash it off, steam at 90 pounds pressure will not remove it. It is used with cotton waste in ordinary journal boxes, and is said to be so tenacious that no amount of jarring will shake it from the fibers and allow it to leak out upon the wheels. Its lubricating power is claimed to be such that one package has sufficed for a run of 50,000 miles, representing more than a year of service.

Vault of the New York Clearing House.

The vault for the New York Clearing House is the strongest in the world. It weighs 571,400 pounds, is 24 feet 4 inches wide, 16 feet 10½ inches deep and 11 feet 6½ inches in height. It is divided into three equal compartments, access to which is given by six doors, three of them weighing 16,800 pounds each. The old method of construction in which a bank vault rests on a stone foundation to guard against tunneling has been abandoned. The new vault will rest entirely on piers and arches of masonry so that the watchman can, at all times, pass under it and inspect the bottom of it.

The walls of the vault are 6¼ inches thick and are built up of alternate layers of iron and chrome steel welded together. Everything about the vault is made to guard against the possible use of explosives. Each of the three compartments contains seventy steel strong boxes which will hold the gold, currency and securities which it is necessary to deposit. The Clearing House is now constructing a new building in which the vault will be erected.

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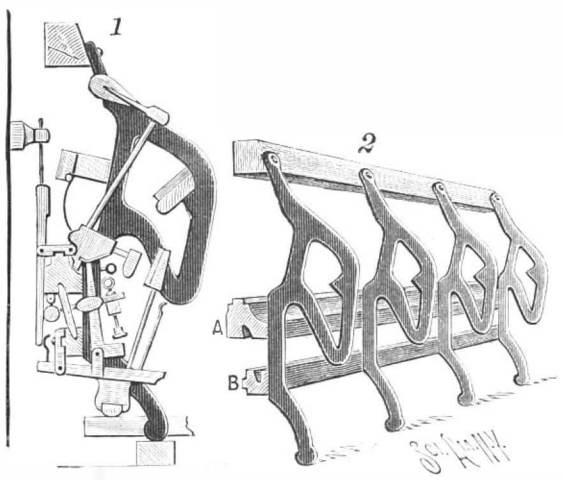
AN IMPROVED PIANO ACTION FRAME.

This is a frame of simple and durable construction, arranged to firmly hold the actions in position and prevent loosening of the arms carrying the pivots for the hammers, dampers, and other parts of the action. It has been patented by Mr. Frederick W. Bothmer, of No. 803 Tenth Street, Long Island City, N. Y. A number of metal brackets are secured in the usual manner to the piano frame, at equal distances apart, and on the rear of the brackets are secured, by machine screws, the rails, A, B, as shown in Fig. 2, a sectional view through the entire action being represented in Fig. 1. The rails are connected with each other by short arms

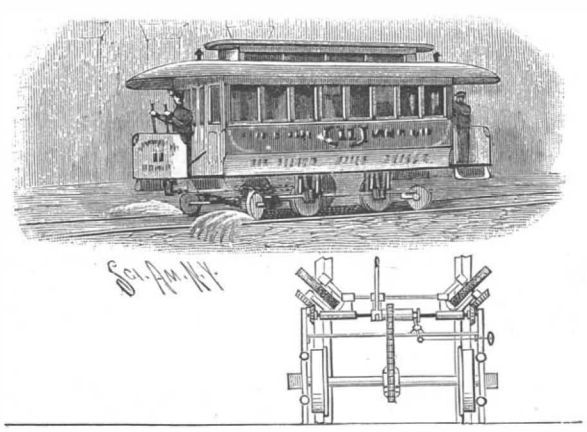


BOTHMER'S PIANO ACTION FRAME.

whose upper ends engage a longitudinal groove in the under side of rail, A, their lower ends being seated in a similar groove in the top of rail, B. In the top of rail, A, is also a ridge adapted to enter a groove in the under side of an arm which forms at its inner end the pivot for the hammer, and at its outer end the pivot for the damper, of the particular action for a single string. On the under side of rail, A, are also lugs engaged by pivot arms of the damper bar, adapted to be actuated in the usual manner from the pedal, and on the rear of rail, B, is a ridge engaging a recess in an arm which carries a lever actuated from the piano key, the two rails, which are made of metal, thus forming firm supports for the pivoted arms, so that a displacement of the hammers and dampers and other parts of the action is not likely to take place.

A STREET CAR RAIL SWEEPER.

It is quite necessary for the wheels of electrically propelled cars to continuously make good contact with the track rails, and to insure this, as well as to facilitate the cleaning of street railway tracks generally, is the object of the improvement represented in the accompanying illustration. It has been patented by Mr. Thomas Waite, of Cramer Hill, N. J. A transverse shaft journaled in the outer end portions of the car, and adapted to be rotated by a chain belt from the car axle, carries near each outer end a loosely mounted sleeve, and integral with each sleeve is a hanger in which a brush is journaled diagonally over the rails, as shown in the small view. On the inner end of each brush spindle is a beveled gear meshing with similar gears on the ends of the transverse shaft, and the hub of the pinion on this shaft, over which passes the chain belt, has a clutch face adapted to engage with a clutch connected with a shifting lever operated by means of a rod terminating in a handle at



WAITE'S RAILWAY RAIL SWEEPER.

one side of the car, whereby the driver or motor man may readily throw the clutch into or out of gear. The two hangers carrying the brushes are connected by a rod, and an elbow lever loosely mounted on the drive shaft has one of its members connected to this rod, while the other member is pivotally connected with a link from which a hand lever extends up through the car platform. By means of this lever the brushes may be elevated to be carried along above the track or thrown down to engage the rails, the clutch on the drive shaft being correspondingly moved into or out of engagement with the pinion driven by a chain belt from the gear on the car axle.

The Use of Quebracho in Tanning.

According to a recent German trade report, the German tanners are now adopting the use of quebracho and other tanning materials, such as divi-divi, myrobalanus, japonica, mimosa, valonia, alogobilla, etc., in place of oak bark. The leather industry in Germany has shown great progress in recent years, and the new tanning material of quebracho has produced a revolution in tanning upper and sole leather. Quebracho is now used all over Germany and in other countries on the Continent. Quebracho wood is imported principally in logs and on sailing vessels. It came originally from the province of Santiago, in Chile, but this source of supply is gradually becoming exhausted. In recent years, in the Argentine Republic, extensive forests of quebracho have been opened. Of quebracho, two varieties are known, the red and the white. Red quebracho is richer in tannin than the white, the average contents being from 18 to 20 per cent. Considering the intrinsic value of this tanning material, it is cheaper than oak bark, and nearly as cheap as hemlock. Owing to its very high percentage of tanning qualities, quebracho contains relatively a small proportion of so-called non-tanning substances, and in this respect it has much resemblance to gambier.

These non-tanning substances are an important factor in the manufacture of leather, as they fill and nourish the leather, and also impart the necessary acidity to liquors, although not assimilating in a direct manner with the fiber of the hide. Quebracho, it is stated, does not possess a sufficiency of these non-tanning properties to yield well nourished leathers, and its use, therefore, is only to be recommended in combination with other agents stronger in non-tanning substances. The supply of quebracho may be considered inexhaustible. Nearing the thirty-first degree of longitude in the Argentine Republic, the Pampas, the largest grazing lands known to the world, gradually develop into immense forests known as chaco. The chaco is wonderful for its luxuriant and varied vegetation; within its limits are found all kinds of tropical trees—among these in abundance the red and white quebracho. The red quebracho, like all other trees found in these regions, with the exception of the palm, does not attain a great height, although the trunk is well developed. Of a reddish brown, this wood is heavy and hard, and has tanning qualities which of late years have become highly appreciated in Europe. Formerly quebracho wood was obtained only from the forests bordering on the Parana River, but now transportation by rail is possible, and gigantic saw milling enterprises have been started which develop the untold wealth of the chaco and send their products to market.

It is stated that the tract of country can furnish a fabulous amount of quebracho wood, practically an inexhaustible amount, while the present yearly consumption is but one million tons. Ten years ago the exports of wood from the Argentine Republic aggregated in value £15,000; during 1892 this value had increased to £300,000. Very recently a saw mill has been erected at each of the ten railway stations between Rosario and Beurequiste. The government allows the privilege of cutting timber within its boundaries, but makes no grants for more than 13 leagues. One league of forest in the vicinity of the railway is considered worth from £1,500 to about £2,000. On the value of the woods arriving at the sea a tax of 3 to 7 per cent is levied. The unlimited supply and low cost of production make quebracho wood one of the cheapest vegetable tanning materials known. About one hundred blows with an ax and a few hours' labor spent in peeling the bark and sawing the logs suffice to secure a ton of wood, whereas it is estimated that about 150 working hours are required to supply a ton of oak bark. The grinding and cutting of quebracho wood is naturally a more difficult operation than getting out hemlock or oak bark, but considering the original cost, this is relatively an unimportant item.

Transportation from the Argentine Republic to Europe can be effected so cheaply that many firms ship their rough lumber to Europe to be worked into extract there. The red quebracho contains in considerable quantity a red coloring matter, which is hardly soluble in cold water, but will dissolve readily in warm water. For this reason quebracho extracts, if not properly treated, will impart a reddish tint to leather. Used alone quebracho extract will only yield a leather of poor color, but when combined with alum and salt it yields finer results even than gambier. Leather tanned with quebracho, alum, and salt has a pale straw yellow appearance, the flesh side being almost white. In first using quebracho extract it is important to use much weaker liquors than those needed with other tanning agents. There are large extract works in Reuners and Benrath, near Hamburg; also in Oberlahnstein on the Rhine, and Frankfort-on-Main. In these factories the wood is cut by machines specially built for that purpose. It is cut from the log in two different ways—side and head cut. The side cut is of fine, thin, small chips, up to about one inch long, and the head cut consists of smaller and coarser pieces. Quebracho extract is manufactured in crystal and soft paste. The crystal is put up in cases of 150 kilogrammes (330 pounds avoirdupois) and costs about £2 15s. It contains about 65 to 70 per cent of tannin. The paste is put up in barrels of from 230 to 250 kilogrammes (506 to 550 pounds avoirdupois) and contains about 45 per cent of tannin.

BRINER'S ASH SIFTER.

This is a sifter of very simple and inexpensive construction, which may be readily attached to or detached from an ordinary ash can or barrel, altogether preventing the escape of dust or other fine particles while sifting the ashes. As shown in the illustration, applied to an ash can of moderate size, the sifting may be done at the side of the stove or range from which the ashes are removed, rendering the device of especial convenience in flats or apartment houses. The improvement has been patented by Mr. Emil Briner, of 54 Rutgers Street, New York City. An open-ended bag of sail duck or other suitable canvas is attached by means of a draw string to the mouth of the can, a second draw string drawing the bag closely over and in from the edges of the can, to absolutely prevent the escape of any dust, and cause the ashes to readily fall into the can. The upper end of the bag is attached by means of another draw string to a circular head in which is a sieve, and a cover is adapted to be set on the head during the sifting operation, as shown in one of the views.

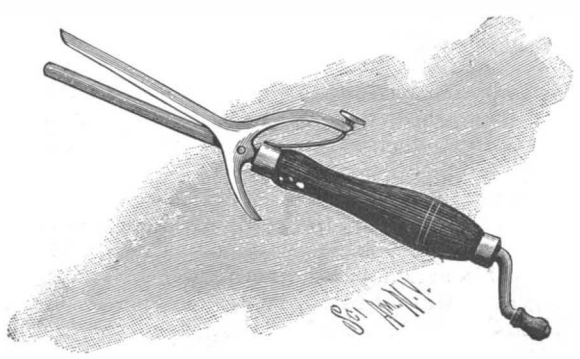
The Lead Wort.

The lead wort, or Amorpha canescens, with its tall, lavender spikes of flowers is found in the dry regions of the Rocky Mountains. It is said to prefer localities where lead exists, whence its name. The effect of the beautiful purplish hue of the blossoms is enhanced by the golden spangles of the yellow anthers among them. The anther cores become bleached after the pollen has been shed and still further add to the beauty of the plant. The anthers mature one after another, the first one out being a little larger than the rest, and not until the last stamen has been fully formed does the small vexillum finish its growth. This is thought to account for its amorphous character.

The lateral growth remains stationary until the axial growth is complete. It then commences, beginning at the apex and continuing downward. Thus the spiral growth uncoils backward, and axial development ceases when the vexillum has been reached.

A SIMPLE HAIR CURLING DEVICE.

This is an inexpensive implement affording a guard for the hair as it is wrapped on the hot iron and obviating liability to burn the fingers. It has been patented by Mr. Edward J. Brand, of No. 61 Fulton Street, Columbus, Ohio. It has two pivoted limbs, one of which is adapted to close upon the other, and a diminished shank of one limb extends through a central recess in the handle piece, at the outer end of which it terminates in a crank handle. One of the limbs is furnished with curved guard wings, and a spring attached to one wing bears at its other end on



BRAND'S CURLING IRON.

a ferrule of the handle, the spring normally holding the limbs closed. On the outer end of the wing to which the spring is attached is a button to protect the hand in manipulating the device when heated. As will be seen, the implement may be readily heated by being hung in the chimney of a lighted lamp, or such other manner as desired.

IN an article in the June number of the Astrophysical Journal, by H. Ebert, he concludes that the temperature of the interior regions of the sun is in round numbers 40,000° C. This is in good agreement with values previously determined by others.

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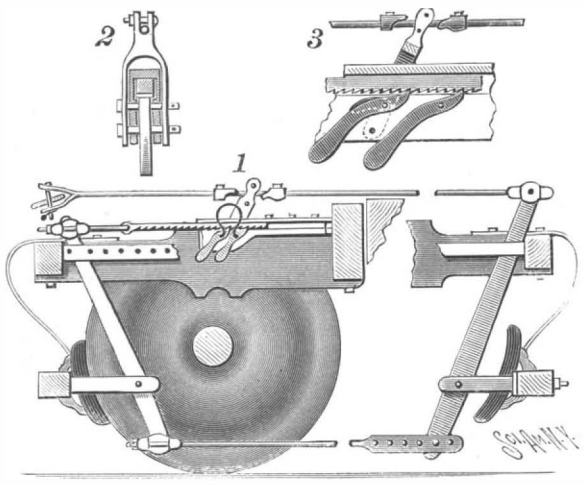
AN AUTOMATIC BRAKE SLACK ADJUSTER.

The illustration represents an improvement designed to automatically take up all the slack in the brake mechanism caused by the wear of brake shoes, permitting a uniform travel of the piston in the brake cylinder and insuring a full and effective pressure in the air brake cylinder at the time the brakes are applied. The

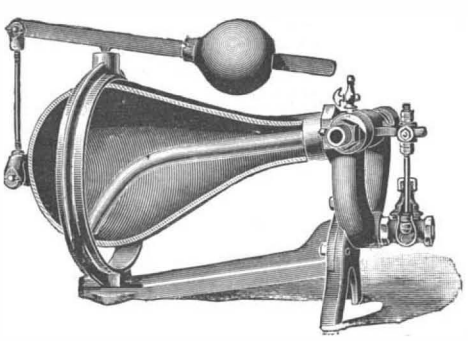


FREESE AND NICHOLSON'S BRAKE SLACK ADJUSTER.

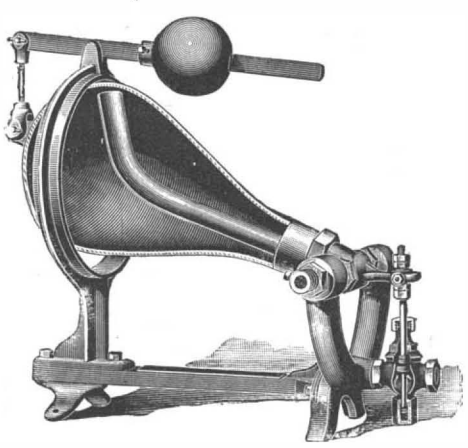
improvement has been patented by Messrs. William De Freese and Thomas E. Nicholson, No. 1296 Topping Street, Hamline, St. Paul, Minn. The brake rod is connected at one end, as usual, with the piston in the brake cylinder, and at its other end with the brake lever, which is connected by a link with the dead brake lever. The latter is pivotally connected, as shown in Fig. 1, with a head in which is held adjustable a rod connected with a longitudinal toothed bar sliding in bearings in a casing, the teeth of the bar being engaged by gravity dogs, of which one has its fulcrum in the casing, while the fulcrum of the other extends through slots into the casing, to engage the forked ends of a lever fulcrumed at its lower end on the casing, as shown in Figs. 2 and 3. Through the upper end of the lever the brake rod passes loosely, lugs being held on the rod at opposite sides of the lever. Near its lower end the lever is pivotally connected with a spring which holds the lever normally in the position shown in Figs. 1 and 3. When from wear of the brake shoes or other cause a slack exists, and the piston in the brake cylinder has to travel beyond its normal stroke, the brake rod is drawn or pulled a greater distance to properly apply the brakes, and one of the lugs on the rod then engages the free end of the lever, swinging it until its dog engages the next tooth on the toothed bar. When the brakes are released and the lever is returned to its normal position, the toothed bar is moved by the dog into engagement with the other dog, which has its fulcrum in the casing, the toothed bar thus taking up any slack in the brake mechanism. The device works automatically and the bar is sufficiently long to take up all slack until the brake shoes are completely worn out.

THE BUNDY STEAM TRAP.

This trap has no interior float. It is operated by the power developed by the weight of the water that collects in the bowl. When the bowl is filled, then the weight of the water, in addition to the weight of the bowl, overbalances the ball weight on the lever, and the bowl settles in the frame, thereby opening the live steam connection from the top of the boiler to the trap. Upon the admission of live steam from the boiler to the trap the check valve in the pipe leading to the trap is immediately closed and temporarily the trap becomes a part of the boiler, subject to the same steam pressure and water line, and hence the water in the trap at once enters the boiler, passing a check valve placed between it and the boiler, on both sides



TANK TRAP.



RETURN TRAP.

THE BUNDY STEAM TRAP.

of which, the steam pressure not being equal, the water of its own weight opens the check and passes in.

After the bowl has emptied itself into the boiler it again becomes sufficiently light so that the ball weight on the lever overbalances it and the bowl is rolled in the frame and the live steam valve is closed, at the same time an air valve underneath the steam valve is opened to allow the escape of any air or vapor that may enter the bowl. A special feature of this trap is the fact that on the air valve pipe a horizontal check valve is used, so that while there is a vacuum in the trap bowl the check remains closed and the vacuum helps to fill it again with water.

The Bundy traps are made in four sizes, holding from five to fifteen gallons of water. They are made by the A. A. Griffing Iron Company, Jersey City, N. J. In the bowl of the return trap there is a bent pipe turned up that is screwed into a diaphragm at the smaller end of the bowl, while the other end terminates near the highest point of the bowl. The live steam upon entering the trap is directed through this bent pipe and so brings the pressure upon the top of the water in the trap. Our illustration shows this feature.

In the Bundy tank trap it will be observed that this bent pipe extends downward from the diaphragm to the lowest part of the bowl, and so, when this trap is discharging, the water is forced up through this pipe and so on out through the discharge valve.

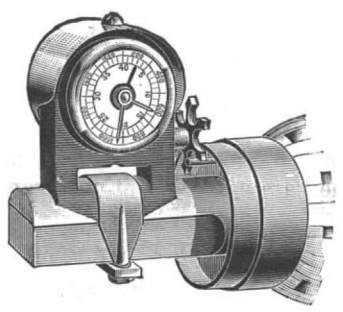
Before all the water is discharged from the tank trap it is so adjusted that the trap bowl will rise in the frame and the discharge valve be closed, so that at no time is the end of this pipe out of water. The water covering the pipe at all times prevents the escape of any steam.

When one takes into consideration the adaptability of steam traps, it is not at all surprising that thousands of these traps are sold, and that so many factories have from one to fifty in use. They may be used as a boiler feed in place of a pump.

THE IMPROVED BELL ODOMETER.

The carriage odometer shown in the engraving accurately registers the distance traveled, and will record and ring a tiny bell as each mile is passed.

It is actuated by a steel pin driven into the hub. This pin engages the spur wheel, shown on the right of engraving, at each revolution of the carriage wheel. The spur wheel is attached to a wormshaft extending through from right to left. Engaging with this shaft is a cut brass gear, termed the unit wheel, mounted on a central shaft extending from the dial plate to the rear. The varying sizes of carriage wheels are compensated by the size of this unit wheel. Keyed to the central shaft is a pawl which sets in motion the internal gears, and these are connected by bushings to indexes on the dial. This pawl is so constructed as not to propel the gears when reversed, thus avoiding all danger of injury when the carriage is backed. With this exception the entire movement is positive and quite accurate, regardless of speed on uneven ground. Attached to the central shaft, back of the case, is a small gong which is struck a smart blow with a spring hammer at each revolution, thus announcing that a mile has been passed.



The dial contains three indexes, each of a different color. The red index registers a mile at each revolution, and, as the dial is divided into forty spaces, each space represents the fortieth of a mile, or eight rods. The yellow index revolves once in forty miles, and each space represents a mile. The blue index revolves once in 1,600 miles, so that each space represents forty miles in relation to this index. The figures inside the ring indicate miles, measured by the yellow index, while the figures outside the ring indicate miles, measured by the blue index. The dial thus constitutes a reliable record of the distance traveled. On starting out, the positions of the indexes may be quickly marked on a dial card—a number of which are furnished with each odometer—and on returning from a drive the distance traveled may be seen at a glance. The dial is protected by a heavy watch crystal, secured by brass bezels screwed in the malleable case. The whole is protected by a neat nickel-plated hood.

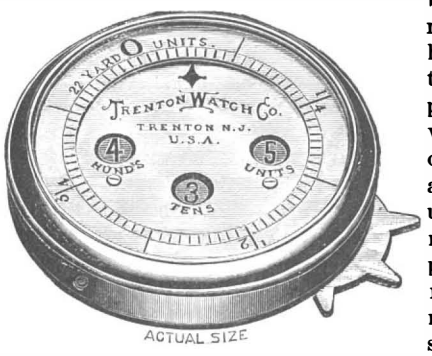
It is now less than two years since this instrument was placed on the market by Messrs. Davis, Stebbins & Company, 33 Sudbury Street, Boston, and the result has been very gratifying to its introducers, numbers of them having been sent to nearly every State and Territory, to the Provinces and to Mexico.

Meteorological Balloons.

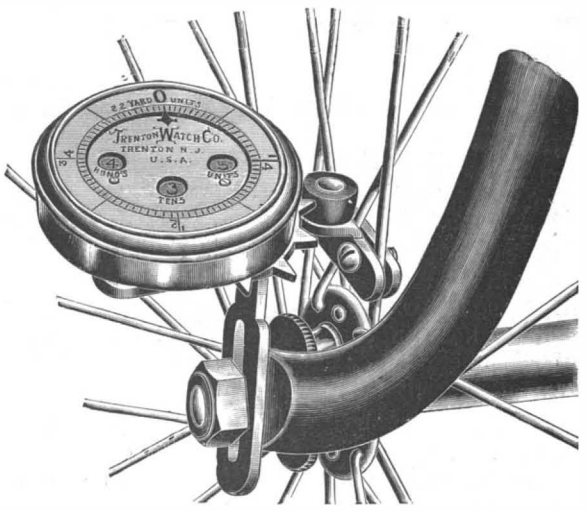
A balloon equipped with self-registering instruments to measure the temperature and pressure of the atmosphere at high altitudes was recently experimented with in Berlin and came down with the instruments in good condition in Bosnia. The instruments showed that the balloon had reached an elevation of 53,872 feet, over 10 miles; the thermometer had fallen to 52 degrees below zero—the lowest it could record. Another balloon sent up later is stated to have reached an elevation of 72,000 feet above the earth, or 13½ miles.

A BICYCLER'S DISTANCE RECORDER.

This compact little measurer of distance traveled by a wheelman, shown herewith detached and applied to a wheel, weighs only 2¼ oz., and registers up to 1,000 miles and repeats. It is made of aluminum, with a satin finished dial which presents a handsome appearance and will not break or crack. It is manufactured by the Trenton Watch Co., of Trenton, N. J., who have admirable facilities for the production of such work in a manner which shall insure absolute accuracy. This cyclometer is noiseless and positive in action, while being also dustproof and waterproof. It can be run backward and forward at the highest rates of speed without the possibility of injury. All instruments before being sent out are tested in a lathe running at many times the speed they will ever be called upon to record on a wheel. One instrument was thus run over one hundred and thirty thousand miles, recording at the average rate of a mile in four seconds, without showing the slightest evidence of wear, and the same instrument was run backward at equal speed. As will be seen from the illustration,



THE "TRENTON" CYCLOMETER.



THE "TRENTON" CYCLOMETER.

it is but a matter of a moment to apply the instrument to a wheel, and its dial can be read at a glance from the saddle.

The New York Botanical Garden.

Under the act of incorporation, the citizens forming the society known as the "New York Botanical Garden" have subscribed $250,000 as an endowment fund, and the Department of Public Parks is authorized to set apart a portion of Bronx Park, not to exceed 250 acres, for the purposes of the botanical garden. The city will also appropriate $500,000 for the construction and equipment of buildings. Bronx Park is about two miles in length and half a mile in width and contains 653 acres; it extends along both sides of the Bronx River, in the northern part of the city. In the botanical museum will be collected specimens of the products of plants. This building will contain laboratories, lecture rooms and an herbarium, which, it is hoped, will ultimately contain specimens of all known plants. There will be a large number of greenhouses of various sizes, which will contain a great variety of growing plants from tropical countries. In the outdoor department will be as large a variety of plants as will grow in this climate; also an arboretum, in which all the trees that can endure our climate will be grown.

THE average speed made on the recent 1000 mile relay bicycle race, Chicago to New York, was 15⅓ miles per hour. Michael, a young Englishman, on May 19, at Paris, made 100 miles in 4h. 2m. 45⅘sec.

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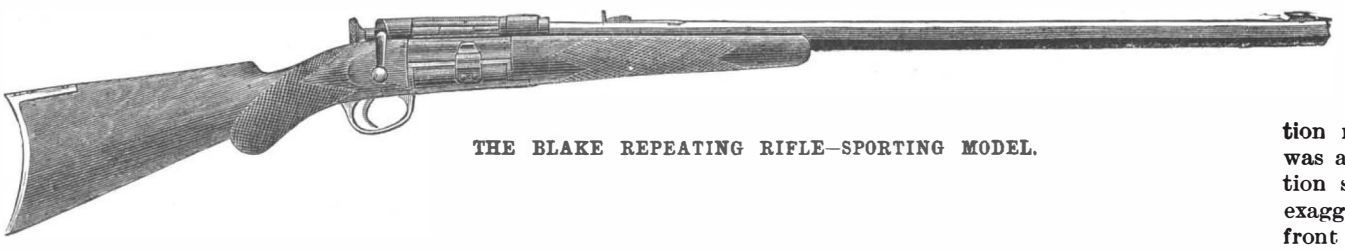
THE BLAKE REPEATING RIFLE.

This rifle was, in its military model, one of those submitted to the United States Army Board on Magazine Arms which reported May 20, 1893. It also was brought before the Navy Board on Small Arms in May of the present year. The inventor and maker is Mr. John H. Blake, of No. 136 Liberty Street, New York. The arm was favorably spoken of by both the Army and Navy Boards, but the radical departure of the magazine system from any known system or any system before either board, made it almost too much of an innovation to be hastily recommended for adoption. Since these tests, sportsmen and rifle experts have encouraged the inventor to put it on the market slightly modified to conform to sporting requirements, the cut showing the sporting model. The system is that technically known as a "multiple loader revolving packet repeating rifle."

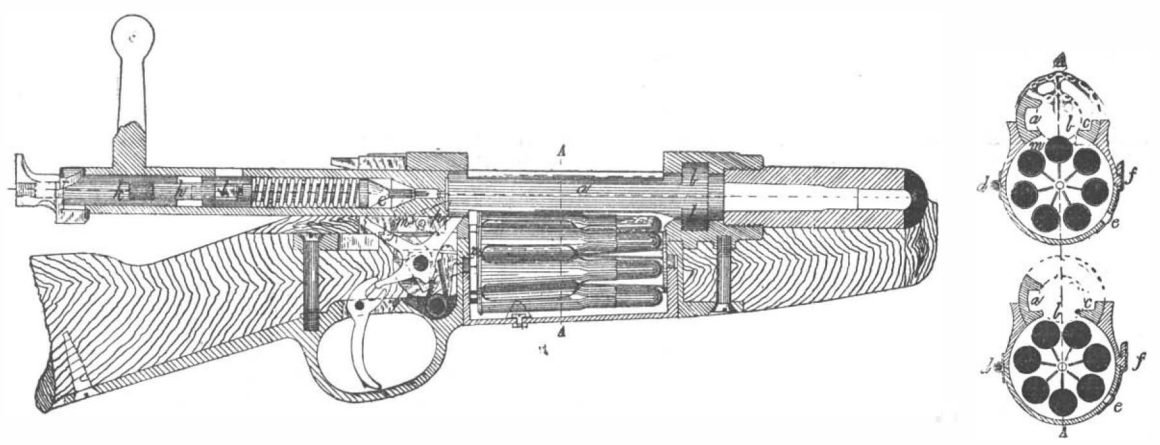
It is a "central" magazine rifle that by the use of a "cut-off" can be used as a rapid single loader, with magazine holding seven cartridges in reserve, available as a repeater whenever the cut-off is thrown in. Single loading fire can be resumed at any time, holding the remaining cartridges in packet in reserve. It is said that an expert is able to fire at the rate of 43 shots per minute until his ammunition supply is exhausted.

The distinctive feature of the system is that of the cartridges being carried in the belt or pockets in a revolving cylindrical packet, holding generally seven cartridges. These packets are charged into the magazine, which lies under the receiver and just forward of the trigger guard, in one movement and "en bloc," as if the packet were a single cartridge. The cartridges are fed into the chamber by a positive movement, and when the cartridge packet is empty, the magazine door is opened, the empty packet drops out and a full packet is recharged. An empty packet may be refilled with cartridges many times, if desired; the packet weighs less than two ounces and can be furnished for a few cents.



THE BLAKE REPEATING RIFLE—SPORTING MODEL.

The rifle holds eight cartridges, one in the chamber and seven in the magazine. Two more packets may be carried in a vest, or shooting jacket, lower pocket, which would give a supply of twenty-two cartridges. If it is thought desirable to carry more cartridges, more packets may be carried in the pockets, or in loops on the cartridge belt as those now in use, the loops merely being larger. A full belt would hold fifteen packets. A belt may have a smaller number of loops, the rest of the belt being looped to carry single cartridges.



THE BLAKE RIFLE—ACTION OPEN.

The action is that of the bolt system. In the sectional view showing the action open, the receiver has on its left hand side a broad and deep groove, a, for the passage of the left locking lug of the bolt, and on the right a shoulder for the extractor and right locking lug of the bolt. The entire bottom is cut away to permit the upward and forward movement of cartridges from the magazine. The forward breech casing contains the grooves for the locking lugs of the bolt, and on the right hand a cut for the hook of the extractor. At the rear the breech casing for a short distance is closed at the top, completely encircling the bolt; back of that a channel is left for passage of the handle, while at the right a shoulder is formed, in front of which the base of the handle locks in the firing position. The magazine casing consists of a cylindrical box placed below the receiver. A central section of it is shown in the small figures, the upper view representing the cartridge packet adjusted for magazine fire and the lower one with the magazine in reserve. Its bottom is hinged at the left side, d, and when closed is secured by the catch, e f. The cartridge packet has at the front and rear ends trunnions, which rest in beds in the front and rear faces of the casing.

The action of this rifle is built strong enough to shoot the 7½ millimeter, or 0·30 cal., U. S. army smokeless rifle cartridge at a muzzle velocity of 2,000 feet per second, which gives a chamber pressure of twenty tons per square inch; and also the 6 millimeter, 0·236 cal. U. S. navy cartridge at a muzzle velocity of 2,500 feet per second, giving a chamber pressure of thirty tons per square inch.

THE splendid lake steamer, the Northwest, recently made the trip from Milwaukee to Chicago, 86½ miles, in 4 hours 6 minutes, being at the rate of 21·13 miles per hour.

How to Ride the Wheel.*

In the course of a paper on "Cycling as a Pursuit," F. W. Shorland, an English bicyclist, has set down a number of hints on riding that beginners will find very helpful. As the recent impetus the sport has received has brought out many new devotees of the wheel, we reproduce here a portion of Mr. Shorland's article.

Cycling as a pleasurable pursuit ceases to be enjoyable when it becomes sheer hard work. In nothing is it so easy to make a toil of pleasure, and therefore my strongest advice to every one indulging in the pastime is to take it easy and not to overdo it. This is, of course, a personal matter entirely. One man's pottering pace is another man's high pressure effort, and I have often noticed how inferior riders will utterly ruin their enjoyment of a run by dreading to acknowledge that they cannot keep up as high a rate of speed as other men with whom they may happen to fall in during a spin upon a frequented road.

Be very careful of strange cyclists. You never know whether they are able to ride or not, and the wobblings of a novice are the most dangerous obstructions of the highway. Even one's own companions are sometimes the cause of collision, especially if they are not used to riding in company. One man can squeeze through a tight place where two cannot, and it is customary for men not used to riding at close quarters to cut in front very dangerously.

In all road riding it is a good plan to avoid sudden changes and violent alterations of pace and course. For instance, in passing a cart it is much better and safer to take a long swing round it than to swerve sharply behind and to return to one's course immediately in front of it. A sudden and jerky style of riding is the usual cause of slipping sideways on a wet and greasy road. Of course, there are certain conditions of road when the most expert riders cannot avoid slipping, especially with plain-faced tires; but these states of greasiness are exceptional, and most side slipping is due to spasmodic instead of smooth pedaling, to bad steering, and a wrong position.

Bad pedaling is a very common defect in the average rider. No man can race successfully without pedaling well; but the average rider who only uses his machine for pleasure would be astonished at his increase of enjoyment, if only he took the trouble to learn to pedal smoothly. It is noticeable, in nine cases out of ten, that the chains of ordinary riders are not kept continuously tight on the driving or upper part. Smooth pedaling, with continuous pressure, will change all that. Backlash should never be permitted, as it is evidence of a slovenly, wasteful style, besides being a very frequent source of slipping.

A smooth, continuous style of pedaling gives one a firm seat on the machine and helps the steering. Every one knows that in slowing a bicycle by back pedaling the conditions of steering are different from those of pedaling forward; if, then, a rider by uneven pedaling introduces a little back pedaling every revolution, he is continually varying the conditions affecting the steering, which consequently is erratic, if not dangerous. Smooth pedaling and a straight course go naturally together, yet the majority of trails one sees are wonderful loopy and zigzag; clear proofs of the prevalence of uneven driving and the consequent indifferent steering.

Alternate plugging on the pedals is hopelessly wrong, and the first aim of any one who wants to ride well should be to get his feet round evenly, not to raise one by the down push of the other in jerks, but by dropping the heel at the bottom of the stroke and, as it were, gripping the pedal, to maintain as near as possible a continuously even driving pressure, one foot taking up the strain before the other ceases to drive.

Although steering and pedaling are so closely related in this respect that it is impossible to steer well when one pedals badly, yet that is not the whole secret of good steersmanship. No one is a good steerer who cannot ride a "safety" with his hands off the handles. I do not advise this style of riding, which is merely the showing off of a really very simple accomplishment, but what I mean is that the ability so to steer shows that one's steering has been mastered. It is only a matter of a few trials, provided one's machine has its frame true and its wheels in line. It means that the rider has escaped from the elementary and erroneous impression that his handle bar is something to keep a tight grip on.

Aching wrists and blistered palms are proofs of bad steering. Handles do not want to be grasped like a try-your-strength machine; they are, when steering is mastered, simply hand rests, and a light touch is all that is needed. Pulling at the handles and wrenching the front wheel about is all wrong. For very stiff hills it is useful as a change to pull at the handles, but when a hill is severe enough to need this style of riding it is wisest to walk.

The third point of importance in style is the position; that is, the relative positions of the handles, saddle, and pedals. The center of the crank axle, to which cranks and pedal are fastened, is a fixed point in the machine, and the handles and saddle are equally adjustable; so it is convenient to measure from this fixed point, and when one's own fit is found, to keep a memorandum of it. A very suitable medium position for all-round work is to have the peak of the saddle just so far back that a vertical line from it hangs against the pedal when at its rearmost position. In the old days of the ordinary, a very vertical position right over the work was assumed, and a reaction set in on "safeties," exaggerated immensely on front drivers to a ridiculously far back position of 14 inches or more, both of which extremes are wrong. The further one sits forward the higher can one's saddle be raised, and in a very far-back position a rider has always to be doubled up, and cannot sit in comfort.

The reach is best determined by noticing, when riding, whether at the bottom of the stroke you can, while keeping the foot in position on the pedal, drop the heel to the lowest possible extent and then find the leg straight. The leg should never be fully extended at any point of the revolution. That is why if at the lowest part of the stroke you exaggerate the position of ankling, and then find the leg straight, you may be certain that for riding purposes you are, as you should be, just within your reach. In any case, it is a far less serious error to be too short than too long.

Handles should be so adjusted that they can be easily reached when sitting in a comfortable posture; not so high that the arms are akimbo, and not so low that a humped-up attitude is enforced. Bicycle hump and a crouched-down stoop are only necessary at sprinting pace when windage is excessive. The majority of the stoops and humps seen on cyclists are due to the rider having his handles too low and trying to sit up to an easier position. A bicycle rider should not copy either a piano player or a man pulling up weeds; he wants his hands about level with his knees when his thighs are horizontal. If they are up too high, he does not get the best results or have as accurate a control of the steering; but even that is better than being folded in half on the machine by an outrageously dropped handle bar.

* From the National Popular Review, originally in the Argonaut.

Street Car Fenders.

A correspondent says: A properly constructed bale or cushion filled with flocculent or equivalent material and of suitable size and shape and restrained from materially yielding otherwise than backward, and arranged to lie or be adjusted in proximity to the track, would, if carried by the car in front, be much more efficient, prevent injury to limb, and be more certain in its action than a metal fender in pushing a body before it on the track or out of the way of harm till the car could be stopped. It is a simple expedient, but often simple means are the most reliable.

THERE are over seven miles of tunnels cut in the solid rock of Gibraltar.

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Correspondence.

Oil, Gas and Water from an Artesian Well.

To the Editor of the SCIENTIFIC AMERICAN:

Under promotion of this club and with the purpose of developing a water supply for this city the first one of three artesian wells has about been completed. It presents conditions which are believed to be novel and of general interest.

The well is 2,487 feet deep and flows about 300,000 gallons of water each twenty-four hours, the initial pressure being 65 pounds and the temperature 120 degrees Fah. There is a double casing from the top to a depth of 2,200 feet, one being 4½ inches (and through it only the water flows) and the other 6 inches in diameter. The 4½ inch pipe then continues to the top of the water-bearing stratum, about 2,400 feet. The water as it appears is strongly mixed with natural gas which readily ignites, so that apparently water and flame flow from the same opening. Scientific analysis shows that the water is impregnated with mineral properties in the proportion as shown below per gallon:

Sodium chloride	226·71 grains.
Sodium carbonate	69·50 "
Calcium bicarbonate	4·31 "
Other solids	2·25 "
Total per gallon	302·77 "

The water has been turned directly into the mains of the public water supply system of the city, and readily furnishes a fine fire pressure, besides filling the standpipe 100 feet high on a neighboring elevation. The gas in the water is a matter of some embarrassment, and it is a problem with us as to how to dispose of it.

Another point of especial interest is that, at a depth of 1,050 feet, a flow of petroleum oil was struck, which has been of the greatest trouble in prosecuting the work, the entire boring plant having been twice consumed by fire on account of it. The flow is remarkable in that it has appeared with a persistent and uncontrollable natural or artesian flow of about 70 gallons a day, and this has continued for nearly a year. A rupture having occurred in the 6 inch pipe, the oil has found it, and now flows between the inner and outer casing of the well with a velocity very much accelerated by the high temperature of the inner pipe.

What to do with the oil and with the gas, and how readily to separate the latter from the water and to utilize the same, are problems which very much puzzle us amateurs, and if they are such as interest the scientific, we would be glad of any suggestion from you or your readers. We think we have one of the most remarkable deep artesian wells in the world.

COMMERCIAL CLUB.

Corsicana, Texas, June 12, 1895.

Cost of Power at Niagara.

The company which has undertaken to develop electricity at Niagara, on a large scale, for manufacturing and other purposes, has acquired more real estate there than it needs for its own use, in order to furnish sites to such of its customers as wish to establish their business close to the source of their mechanical power supply. But the public has been led to expect that in addition to serving local interests, the company would also furnish electricity to places scores, if not hundreds, of miles away, and there has been much speculation as to the feasibility of carrying such plans into effect. Owing to her proximity to the Falls and her great size and industrial activity, Buffalo has been regarded as the first center of population, removed from Niagara, to be provided for. It is not yet quite clear whether that city feels that it is enjoying a privilege or conferring a favor in letting the power company invade its precincts. Perhaps she has not determined that point herself. The matter is evidently still under consideration. In reply to some inquiries from representative Buffalonians, the Power Company recently offered the following terms:

It would let the municipality or a private corporation come to Niagara, take water from the Power Company's canals at the rate of $10 a horse power, and manufacture its own electricity; or it would furnish power off the turbine shafts at $13, or electricity at the power house at $18. But if the Power Company undertook to do anything of this sort, it would not contract to deliver less than 10,000 horse power. Hence Buffalo must agree to take at least that much or none at all. The Niagara people would not accept a franchise to operate a line to and in Buffalo for a shorter time than that for which its own bonds have been issued. No price is given for electricity delivered at a central station in the suburbs of that city, fifteen miles from the Falls, so that the company's own estimate of the probable waste and cost of transmission is still withheld.

There would be four kinds of losses: (1) In transforming at the power house up to a high voltage, (2) on the line, (3) in transforming down at Buffalo, and (4) in distribution over street lines to consumers. These could not well amount to less than 20 or 30 per cent altogether, and they might, perhaps, reach 50 or 60 per cent. But if, for example, they amounted to just one-half, the $18 rate at the generator shaft would mean $36 to the consumer, without adding anything either for interest on the cost of the transmission plant or for operating expenses. This, however, is probably an extravagant estimate. The prices actually given, by the way, are for a twenty-four hour daily supply. Some establishments require power, however, for only ten or eleven hours. Whether it would pay to put in storage batteries to utilize the surplus is a question which their managers must naturally consider.

Richard Hammond writes to the Buffalo Courier to say that steam power, on a scale of 1,000 horse power for ten hours daily, can be generated in Buffalo, where coal is very cheap, for $21 per horse power. The Power Company, however, denies this, and estimates the cost at $32, besides quoting various experts as estimating the cost on a twenty-four hour basis at between $45 and $60. In some other cities, where coal is more expensive, it is said to be from $60 to $75. If, after this discussion, Buffalo decided neither to buy on the terms offered nor to let the Power Company bring in its own lines and supply the market, more distant cities may possibly be deterred by her example from patronizing the Niagara concern; but as the latter supplies its local customers with electricity at $20 per horse power, in large quantities, there may be a greater industrial development at the Falls than would otherwise result. —New York Tribune.

Electrical Notes.

Benjamin Franklin on Torpedo Fish.—An interesting letter of Benjamin Franklin on the stroke of the so-called torpedo fish is preserved in the electrical department of the Armour Institute, Chicago. It was written during Franklin's second mission to England, while he was engaged in devising means for protecting the powder magazine at Purfleet from lightning. He was very busy at this time and was, besides, involved in a bitter political quarrel with Lord Hillsborough, the Secretary of State for the Colonies; but he, nevertheless, found time to study torpedo fishes and their effects.

The letter is indorsed: "Franklin's Instructions to Try if the Stroke of the Torpedo be Electrical," and is, in full, as follows:

It has long been supposed that the Stroke given by the Torpedo was the Effect of sudden violent muscular Motion. It is now suspected to be an Effect of the Electric or some similar subtil Fluid which that Fish has the Power of acting upon and agitating at Pleasure.

To discover whether it be the Effect of a subtil Fluid, or of Muscular Motion, let the Fish be touch'd with the usual Conductors of Electricity, viz.:—Iron, or other Metals; and with the known Non-Conductors, dry Wood, Glass, Wax, etc. If the Stroke be communicated thro' the First and not the Latter, there is so far a Similarity with the electric Fluids, and at the same Time a Proof that the Stroke is not an Effect of mere muscular Motion.

Let it be observed whether the Stroke is sometimes given on the near Approach of a conducting Body without actual Contact; if so, that is another similar Circumstance.—Then observe whether in that case any Snap is heard; and in the Dark any Light or Spark is seen between the Fish and the approaching Body. If not, there the Fluids differ.

Let a Number of Persons stand on the Ground, join Hands, and let One touch the Fish, so as to receive the Stroke. If all feel it, then let him be laid with his Belly on the Plate of the Metal; let one of the Persons so joining Hands touch that Plate, while the farthest from the Plate with a Rod of Metal touch the Back of the Fish; and then observe whether the Force of the Stroke seems to be the same to all in Circuit as it was before, or stronger.

Repeat the last Experiment with this Variation. Let two of the Persons in the Circuit hold each an uncharged electric Phial, the Knobs at the Ends of their Wires touching. After the Stroke, let it be observed whether those Wires will attract or repel like Bodies, and whether a cork Ball suspended by a long silk String, so as to hang between the Wires at a small Distance from the Knobs of each will be attracted and repelled, alternating to and from each Knob; if so, the Back and Belly of the Fish are at the Time of the Stroke in different States of Electricity.

London, August 12, 1772. B. FRANKLIN.

The Slavianoff Electric Welding Process.—The Slavianoff system of electric welding, or the Slavianoff smelting system, as its inventor calls it, is coming into extended use in Europe, and has been for some time in successful operation in the celebrated Perm Gun Works in Russia. It is said to be an improvement on the well known Thomson and Benardos systems. Its principle depends upon the employment of a bath and the development of hydrogen at the negative pole, surrounding the part to be welded. The gas thus forms a high resistance to the current at this point, producing a corresponding amount of heat, which is communicated to the negative pole. A supply of molten metal, of the same character as the object to be welded, is supplied to the fractured part. This is accomplished by using the object operated upon as one electrode and a bar of the same metal as the other. During the welding this bar is gradually melted down and constantly supplies metal to the fracture as it is needed. A spring and solenoid automatically regulate the feed.

The Slavianoff process is, it is said, applicable to all ordinary metals. Some remarkable work has already been done by it at the Perm works. Some of the fractures repaired without difficulty were such as would have offered almost insuperable obstacles to any other known system. One of these was a bell about six feet in height and in its greatest diameter that was cracked from top to bottom. Another was an immense roll from a rolling mill broken in two near the center.

Measuring Specific Inductive Power.—A new method for measuring specific inductive power has been described by Mr. Nodon and Prof. Pellat. They employed two metallic spheres of small capacity, placed some distance apart and connected with an induction coil, and a third, movable, sphere grounded through a telephone. This third sphere is placed between the other two, its position being determined by the point at which no sound is heard through the telephone.

The dielectric to be tested is placed between one of the stationary spheres and the movable one, and the latter is moved toward the dielectric until the telephone again becomes silent. The distance between the first and second positions of the movable sphere will then be proportional to the specific inductive power of the dielectric. In using the apparatus a material whose inductive capacity is known is first used; the unknown substance is tested from this or a standard. The two specific inductive capacities will be directly proportional to the distances found in the two tests.

Electricity from Heat.—M. Desire Korda, a French electrician, has recently made a thermo-chemical galvanic cell, using ordinary gas retort carbon and a few cubic centimeters of barium peroxide. The salt is simply placed upon a flat piece of the carbon and the latter is heated to redness in a gas flame. A violent effervescence takes place and carbonic acid is given off. A voltmeter, whose terminals are connected by means of platinum wires with the carbon and the salt respectively, shows a deflection indicating a difference of potential of about one volt.

If cupric oxide, resting upon a layer of potassium carbonate, be used instead of the barium peroxide, a voltage of 1·1 is indicated.

Dynamo and Steam Engine Efficiency.—Prof. Unwin complained, in a recent lecture, that electrical engineers were in the habit of comparing the efficiency of the dynamo with that of the steam engine, greatly to the discredit of the latter. It is a common saying, he adds, that the efficiency of a dynamo is from 90 to 95 per cent, while that of the steam engine is only about 10 per cent; but this comparison is an unfair one, and shows a lack of comprehension of one of the two fundamental laws of thermodynamics, namely, the law of the motivity of heat. Heat energy is undirected energy and only a fraction of it is convertible into mechanical energy. Working, as it must, with only this available fraction, the steam engine is not an inefficient machine. The task of the dynamo is simpler. Electricity is directed energy in a wholly convertible form, and it is, therefore, only necessary to transform one kind of directed energy into another. In order to do this, only a small fraction need be wasted. Prof. Unwin says further that the electrical engineer is to blame for his ingratitude, as without the steam engine the dynamo would be but a useless mass of metal and wire.

Silvering Glass.

A simplified process for silvering glass is thus described by MM. Auguste and Louis Lumiere, in the Journal de Physique. Take 100 parts by volume of a 10 per cent solution of nitrate of silver, and add, drop by drop, a quantity of ammonia, just sufficient to dissolve the precipitate formed, avoiding any excess of ammonia. Make up the volume of the solution to ten times the amount by adding distilled water. The reducing solution used is the formaldehyde of commerce. The 40 per cent solution is diluted to a 1 per cent solution. The glass to be silvered is polished with chamois leather, and the bath is made up immediately before use by mixing two parts by volume of the silver solution with one of formaldehyde. The solution must be poured over the surface without stopping. After the lapse of five or ten minutes, at a temperature between 15 degrees and 19 degrees C., all the silver in the solution will be found to have been deposited on the glass in a bright layer, which is then washed in running water. It is then varnished, if the glass side is to be used; or polished, if the free surface is required for reflection. This method does not require the scrupulous care necessary with other methods.

The American Cotton Crop.

On June 1, the visible supply of cotton in this country for 1895 was 9,520,085 bales. This is 2,212,820 bales more than were indicated by the crop at this time last year. These figures indicate that the entire crop this season will be no less than 9,800,000 bales, an amount that has never, heretofore, been approached.

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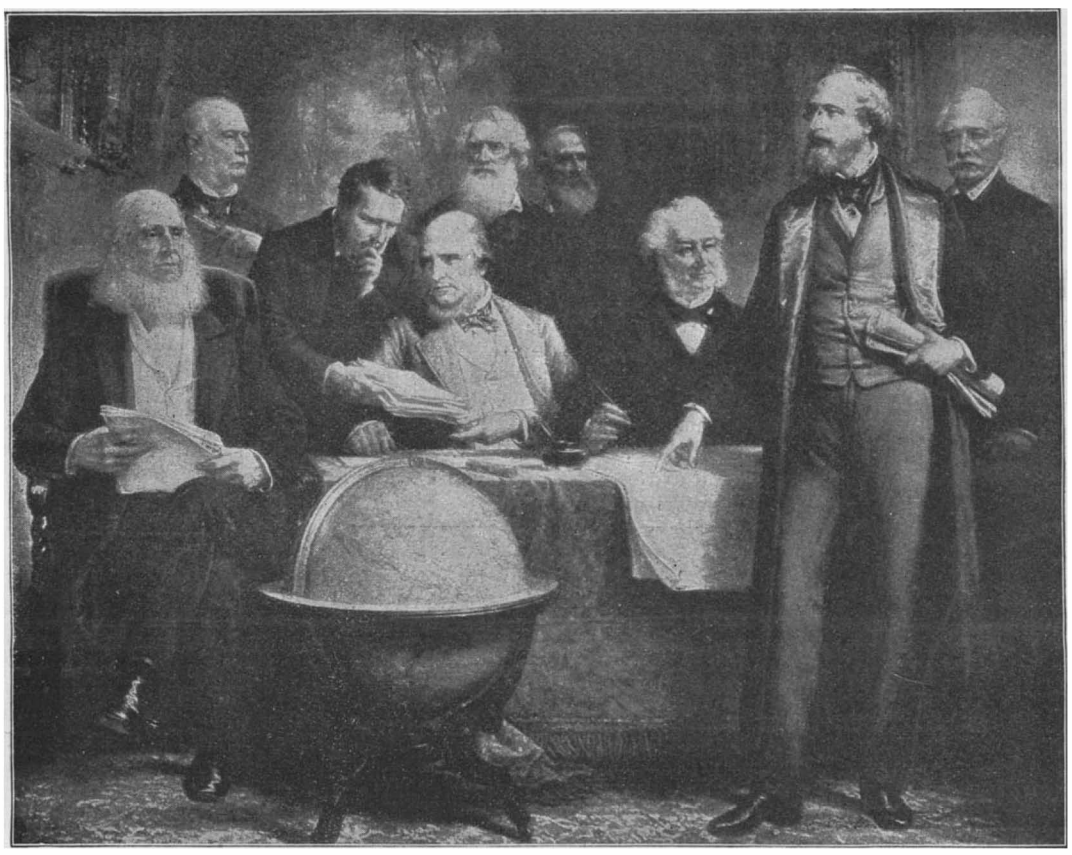
THE PROJECTORS OF THE ATLANTIC CABLE.

A special meeting of the New York Chamber of Commerce was recently held formally to receive the painting entitled "The Projectors of the Atlantic Cable," presented to it by fifty-two of the leading citizens of New York. Morris K. Jesup, chairman of the special committee having the matter in charge, presented the painting to the Chamber in an appropriate speech. Dr. Chauncey M. Depew delivered the oration, paying a glowing tribute to the memory and achievements of Cyrus W. Field, Moses Taylor, Marshall O. Roberts, Wilson G. Hunt, Professor S. F. B. Morse, Chandler White, and David Dudley Field.

The painting represents a meeting of the projectors of the Atlantic cable at the residence of Cyrus W. Field, in Gramercy Park. The venerable Peter Cooper is presiding. To the right stands Mr. Field, who is calling attention to a chart of Trinity Bay, pointing to Heart's Content as a safe harbor for landing the cable. David Dudley Field stands behind the president with a law book. Chandler White is handing estimates of expenses to Marshall O. Roberts, next to whom at the table is Moses Taylor. At the end of the table stands Wilson G. Hunt. Professor Morse is standing behind Mr. Roberts and by his side Daniel Huntington, the artist, sketching. The original idea of the picture was suggested by Mr. Field to Mr. Huntington shortly after the completion of the cable.

D. D. Field. S. F. B. Morse. Daniel Huntington. Wilson G. Hunt.



Peter Cooper. Chandler White. Marshall O. Roberts. Moses Taylor. Cyrus W. Field.

THE PROJECTORS OF THE ATLANTIC CABLE.

GREAT FALLS AND GEYSERS—YELLOWSTONE NATIONAL PARK.

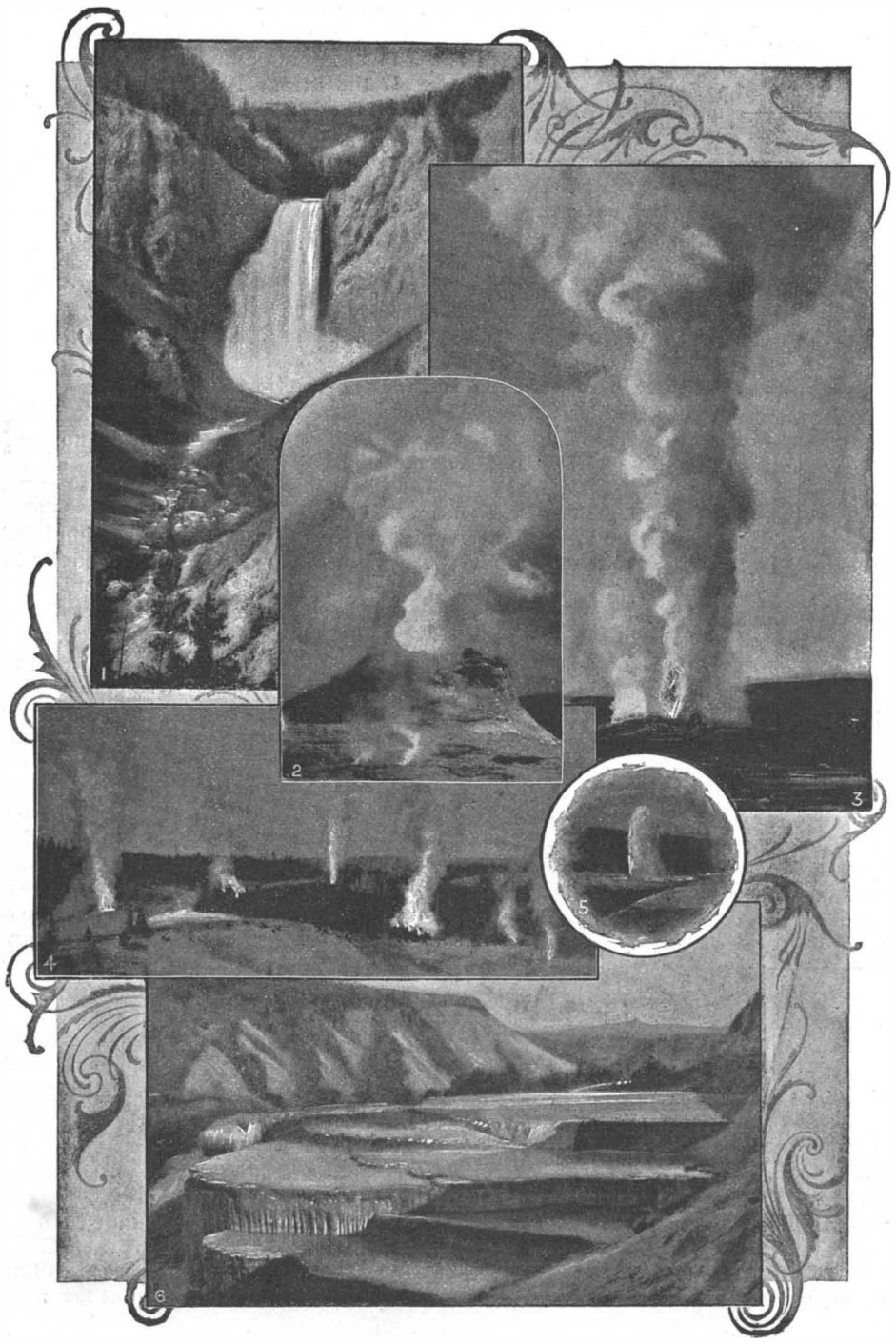
The accompanying illustrations are views in Yellowstone Park. Of all the remarkably beautiful localities of this country, that tract of land stands pre-eminent in the grandeur of its glacial and volcanic scenery; its lofty snow and ice capped mountains; its silvery lakes; and its turbulent rivers, cascades and falls. The park covers an area of about 200 square miles and comprises the greatest geyser region of the world, together with some of the most wildly beautiful scenery.

Foremost among the natural attractions of this place is the Grand Cañon of the Yellowstone and its Falls. At places this grand gorge is 2,000 feet deep, while the bottom of the cañon is hardly wide enough to permit the river to pass through, notwithstanding its wildly turbulent character. The falls are two in number, the upper and lower, and are about one-quarter of a mile apart, the first being 140 feet in height, and formed by a perpendicular cliff over which the water dashes in a smooth, silvery sheet. Below the falls the speed increases as the cañon narrows, and the river breaks into a grand roaring stream of foam and spray, only calming the instant it takes its second leap over a precipice 390 feet in height and forming the second fall. The first portion of the illustration is a view of the cañon and its upper fall.

If the Yellowstone, its cañon and its falls, can be surpassed in point of beauty and interest, the geysers and other volcanic features of the park present perhaps still more striking objects, for here are found the most beautiful geysers of the world. Some hourly shoot vast streams of steam and water high into the air, and others make themselves known only at periods of months or years. The principal and most regular geyser of Yellowstone Park is Old Faithful, which may be seen in eruption hourly, while the larger geysers erupt at greater intervals; the Giantess after days and Excelsior only in years.

Geysers are only found in volcanic regions, the principal localities being Iceland, New Zealand and Yellowstone Park. They are generally thought to be passages in the earth communicating with subterranean caverns or reservoirs of hot water, the periodical discharges of steam and water being due to convulsions occasioned by the generation of steam in the passages or tubes. It is known that water will boil at different degrees of heat at different elevations, and it is to this fact that is due the eruptions of the geysers. Assuming a geyser tube to be filled with water and to be at an elevation where water will boil at the mouth of the tube at 100° Centigrade, under normal conditions the water at the mouth of the tube has not this heat, while the water some distance below has this or even a greater heat, but as we descend the boiling point becomes higher, and this greater heat of the water is always below its corresponding boiling point in the same manner as at the mouth of the tube. When, however, the increase of water and vapors at the base of the tube and in the subterranean caverns with which they communicate results in a sudden lifting of the water in the tube, the highly heated water at the lower parts thereof is lifted to an elevation at which it will boil, whereupon the water in the tube is started to boiling, and the geyser is then in the height of its eruption. As soon as these abnormal conditions cease the geyser subsides into inaction, only to be again awakened when the above conditions recur.

Closely related, both in origin and nature, to the geysers, are the hot springs. These are most plentiful in Yellowstone Park, along Gardner River, where they bubble continuously and where their clear, limpid water soon cools and settles in terraced reservoirs along the sides of the mountains, presenting a most beautiful appearance in the blending of the many colors of the coral-like formations at the terraces, and in the exquisite clearness of the water. Principal among the terraces is the Minerva Terrace, which is composed of a series of successively elevated reservoirs, from one to the other of which the water flows in beautifully clear and smooth sheets. This terrace is shown in the illustration.



GREAT FALLS AND GEYSERS—YELLOWSTONE NATIONAL PARK.

The Organ of the American Liner St. Louis.

The SCIENTIFIC AMERICAN, in its issue of June 15, presented an illustration of the saloon of the new American Line steamer St. Louis, showing at the further end the organ built for the vessel by Messrs. Jardine & Son, of this city. The organ is the first ever put into a sea-going vessel, and some interesting modifications in construction were necessary to adapt it to the peculiar conditions to which it is subjected. Each pipe is supported separately by fastenings which admit of expansion and contraction. All the metal fittings are of brass, instead of iron or steel, that the dampness may not affect them injuriously, and, for the same reason, no glue is used in the woodwork, but everything is screwed fast.

The entire action of keys and stops is electric, and the keyboard is forty feet away from the pipes. The contacts are frictional and, therefore, self-cleaning. The magnets controlling the pipe valves consume only 0·05 of an ampere in current, and but 2 volts tension is required. The current is supplied by a 300 ampere-hour storage battery, charged when necessary from one of the ship's lighting dynamos.

Another organ, similar to that of the St. Louis, is now being built for her sister ship, the St. Paul.

ELECTRIC cars have been prohibited on the road from Berlin to Charlottenburg. They would have passed by the Imperial Technical Institute, and experiments showed that the current for the railroad strongly affected all the apparatus in the building, so as to make delicate scientific observations and experiments impossible.

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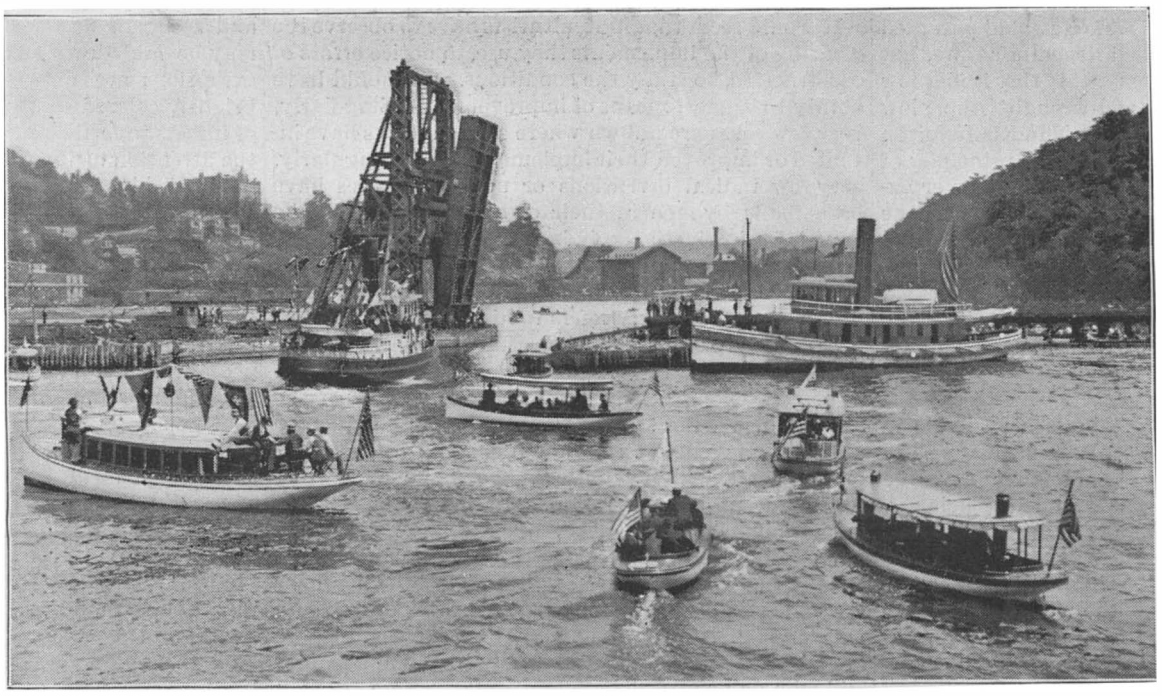
THE OPENING OF THE HARLEM CANAL.

The improved waterway through the northerly part of this city, joining the North and East Rivers, was thrown open for navigation on Monday, June 17, 1895, with elaborate ceremonies, including a land and marine parade by civic and federal dignitaries. The ceremonies concluded with a banquet and fireworks. The term "ship canal" is really a misnomer as applied to the Harlem Canal. The canal is designed only for canal boats and small inland water craft. The Harlem River, before the canal was begun, narrowed to little more than a creek at Kingsbridge and there connected with the waters of Spuyten Duyvil Creek and then with the waters of the Hudson; this allowed a depth of only two feet of water.

The work has been carried on by the federa authorities under the direction of Geo. L. Gillespie, Lieut.-Col. of the Corps of Engineers, U. S. A., who was appointed chief engineer of the operations. It was provided that the sum of $2,700,000 should be expended to make to make a navigable waterway. $900,000 of this sum has already been spent. The channel is ultimately to be 350 feet wide and 18 feet deep. It is now only 150 feet wide. Several years will elapse before the work is completed. The present minimum depth of water in the river is nine feet. At present the Harlem River is practically limited for navigation to the point marked by High Bridge. When dredged out and completed to the Hudson River a clear waterway will be provided for all vessels able to pass through the draw and under the High Bridge. In transit from the North River to the Sound this route will cut off a distance of 10 or 12 miles.

We have heretofore illustrated this great engineering work, and full details thereof are reproduced in our SUPPLEMENT, No. 1015.



OPENING OF THE HARLEM CANAL—VIEW FROM THE HUDSON RIVER.

Testing the Great Lens.

A test of the 40 inch lens for the great Yerkes telescope took place a few days ago at the establishment of Alvan G. Clark, at Cambridge, Mass. The observatory of the Chicago University was represented by Prof. T. J. See. The test was made with Arcturus, Saturn, and double stars. The astronomers present were much pleased with the lens, which will soon be ready for delivery. According to the Boston Evenint Transcript, a most novel form of telescope, which was highly praised by the company gathered at Mr. Clark's shop, was the binocular telescope constructed for D. W. Edgecombe, of Newington, Conn. This may be popularly described as a huge opera glass. It consists of twin telescopes of 6¼ inches aperture, which lie side by side precisely as do the tubes of the opera glass.

A Milk and Cream Separator Bursts with Fatal Results.

At Pittsburg, Pa., on June 18, by the explosion of a milk and cream separator, revolving at the rate of 13,000 times a minute, an accident occurred at 2110 Carson Street, south side, resulting in the death of Philip Deibl, vice-president of the Milk Dealers' Exchange, of Western Pennsylvania, and the serious but not fatal injury of James R. Miller, Otto Winterhalter, and Albert Winterhalter, milk dealers. It required 8,500 revolutions per minute for the machine to separate the cream from the milk. A greater number of revolutions is dangerous. In some manner the separator did not perform its work, and the revolutions increased suddenly to 13,000, when it exploded.

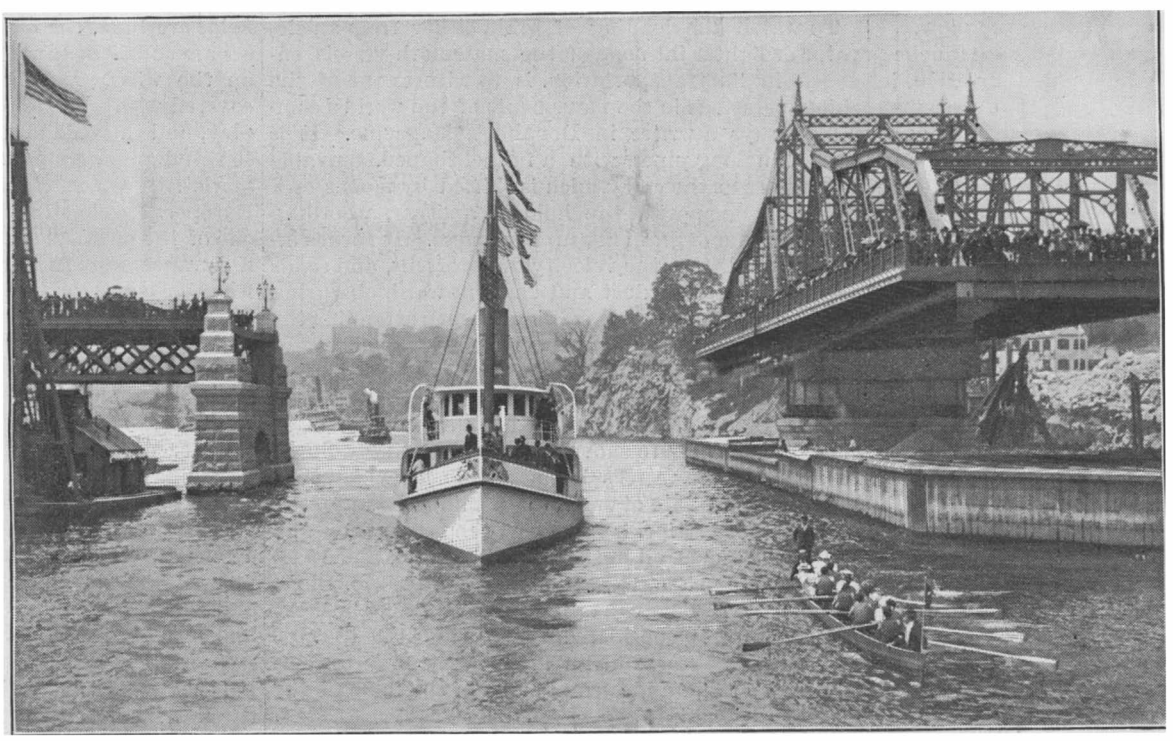
OF the English Bench of Bishops twelve are pledged abstainers.

The Bicycle.

The value of the bicycle as an aid to health has been dwelt upon since the beginning of the sport, but there are other advantages to be derived from it of equal or greater importance.

Cycling cultivates the habit of rapid thinking—indeed, one whose mind is not more than ordinarily alert, and whose muscles cannot be trained to be the instant servants of the will, is not liable to pass through the several stages of cycling without accidents. Keen perception and good judgment are two qualities, above all others, which the rider of the wheel should strive to acquire, and they are cultivated in a high degree by the "king of sports." Not only must the urban cyclist thread his way among many vehicles, electric cars, and numberless other impedimenta, but his rural brother as well has need of a cool brain, sharp eyes, and steady nerves in order to avoid the ever possible mishap. The rider should invariably be cautious, yet ready to make a bold dash to escape danger or to avoid giving annoyance to others awheel or afoot. But still more important is the cultivation of accurate observation and of the sense of beauty developed by the proper use of the wheel. Since the cycle became the vehicle of the masses, thousands to whom their rural surroundings were practically terra incognita are turning their steeds away from city life and by a study of flowers, trees, rocks, and other natural objects are broadened in mind while strengthened in body by the vigorous exercise. To him who travels aright, landscapes become a delight and he grows to love Nature in her varied moods. He learns, too, much of the country around him—its people and their pursuits—not only in his immediate neighborhood, but within a radius proportioned to his leisure.

As a teacher of practical geographical knowledge the wheel is the most thorough in the world; nothing approaches it in the encouragement of the love of outdoor life and appreciation of the beauties of nature, which are so apt to be lost sight of in a world almost canopied by commercial life.—Bicycling World.



OPENING OF THE HARLEM CANAL—THE KINGSBRIDGE DRAW.

French Inhumanity.

The isolated spot where Captain Dreyfus has to serve his sentence comprises three small islands off the coast of French Guiana, a few degrees north of the equator, and except a narrow sea frontage, are covered with tropical forests. The climate is simply murderous, certain death being the result of standing bareheaded in the sun even for an instant. From November to June is the wet season, during which the average rainfall is 180 inches; yet the temperature is never less than 85 degrees, and rises to 115 degrees during the four dry months. Convict ships bound for these "Islands of the Curst" generally sail either from the Ile de Re, in the Bay of Biscay, or the Ile d'Aix, in the Mediterranean. A month is occupied by the voyage, the horrors of which are a fit prelude to those yet to come. Dressed in their convict garb, the prisoners are confined in batches of fifty in great iron cages on the spar deck. Benches are placed round the sides of the cage and hammocks are slung at night. But day and night they are watched by guards standing beside loaded mitrailleuses, ready to fire at the first sign of mutiny. Sometimes, indeed, such outbreaks do occur, but they are invariably quelled with remorseless severity. The horrors of the passage are too repulsive for description, the scenes resembling rather those observable a century or two back than what one would associate with the present times.

On the arrival of the prisoners at the Iles de Salut they are taken to the "Camp," a clearing occupied by strongly-built iron-barred huts, furnished with double rows of hammocks. But at night the fetid atmosphere within, combined with the noisome vapors of the outer air and the ever-present swarms of stinging insects, render any but the sleep of exhaustion impossible. From the moment of his arrival the convict has no name. He is known only by the number of his hammock. The new arrivals are put to the most severe tasks—draining marshes and clearing ground—"to break their spirits." They are conducted to their work by armed guards, who are ordered to fire at the least attempt at flight. Hardly any try to escape, for they know that if they evade the bullets of the guards and their pursuit, it will be necessary to traverse the sea and the virgin forest. At every step will lie in weight for them death by hunger, by fatigue, by disease, or by the poisoned arrows of the natives, who receive a reward for every convict they bring back, dead or alive. Meanwhile, with bodies broken by their awful toil in a climate where a walk of a hundred yards is a formidable task, they labor in the blazing sun with spades and picks. About their heads hang clouds of stinging insects. Great red ants cover their bare legs, and sometimes poisonous serpents twist about their ankles and inflict mortal wounds. They stand in trenches up to their knees in water and mire, and the exhalations rising from the earth consume them with fever, or set their teeth chattering as with cold, while the sweat rolls from their foreheads. Occasionally, in their despair, some of the convicts revolt, in the hope, which is seldom disappointed, of finding in the bullets of their custodians a relief from this living torture. Others again go mad, or end their lives by deliberately exposing themselves to the sun, while very few ever succeed in escaping. Indeed, only once have any fugitives reached civilized countries again, and even then their period of freedom was comparatively brief.—Public Opinion.

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The Faults of the Plow.

The primitive Egyptian and Assyrian plow consisted of a forked branch of a tree, one arm of which served as a share, loosening the soil, the other as a beam, drawn by human or by animal power. This was the original double mouldboard or lister plow, throwing the soil both ways. An improvement was made by so shaping the wooden mouldboard as to form a twisted wedge, which elevated, inverted, and carried the soil to one side only of the plow. A further improvement was made by making the point of the share of iron. Simple as it seems, it was not until April, 1831, that center draught was given to the plow by Meares, who inclined the beam inward. In 1797, Newbold patented a cast iron plow, and commenced its manufacture, but abandoned it, for the farmers said the iron plow poisoned the land. The steel and wrought iron plow was not invented until 1808. In 1788, Thomas Jefferson improved the plow by showing its proper principles of construction, and in 1836 and 1837 Daniel Webster experimented in plow manufacture, and said that none of his successes in public life had given him so much pleasure as seeing the improved plow of his own construction, drawn by six yoke of oxen of his own raising, cut broad and deep furrows through brush and saplings. In 1845, Governor Holbrook invented a method of shaping plow mouldboards symmetrically, either convex or concave.

All of the improvements which have been made in the plow, from the earliest agriculture until now, are simply modifications of the original idea: a wedge drawn through the soil, pulverizing and displacing it. No better method has been found.

The faults of the plow are serious ones. The bicycle may be credited with having brought ball bearings into general notice and showing the striking decrease of friction when sliding friction is converted into rolling friction. All of the wearing surfaces of the plow are sliding frictional surfaces, and the loss of power occasioned by friction of sticky earth upon the plows of this broad domain of ours is past computation. The plows of the day are rigid and inadjustable in form. In sandy or in loose and light soils, and in lumpy or clayey soils, in shallow or in deep plowing, in plowing at slow or at fast speed, no adjustment or change of form can be made to suit the special conditions of the work, yet these different conditions are often found in one plantation, and the plow should be capable of being modified to suit these conditions.

If a perpendicular line is drawn from the point of attachment of the harness tug and hame to the ground, and another line from the same point to the center of work in the mouldboard of the plow, and a horizontal line connecting the center of work with the perpendicular line, then the hypotenuse of the triangle thus formed represents the total tractive effort, the horizontal line, or base of the triangle, represents the useful tractive effect, and the perpendicular line represents the part of the traction which is expended in pulling the horse down upon the ground. In some cases one-third of the tractive effort of the horse is expended in increasing the pressure of the horses' feet upon the ground instead of in advancing the plow.

In a 14 inch plow the earth is elevated say 14 inches, carried sideways 14 inches and deposited, inverted, in the preceding furrow. It is easy to see that each inch of unnecessary elevation represents a great amount of unnecessary labor during the lifetime of a plow, and that the carrying of all the surface soil sideways to the preceding furrow represents a great aggregate travel of soil; that is, effort in plowing large fields.

The share of the plow, like the fluke of a ship's anchor, is shaped so as to draw down into the soil. The line of traction, from the center of the mouldboard to the center of the horse collar, tends to draw the plow out of the ground. The plow advances horizontally as a sort of compromise between these divergent lines, and there clearly results a loss of power occasioned by the line draught being in one plane while the line of traction is in another plane.

When the total weight of all the surface soil which is elevated, and also carried sideways, in plowing all the cultivated area of this country is calculated, it is clearly seen that the agriculturists of the country waste each year, in incidental but not in useful work, in excessive sliding friction, in indirect lines of traction, in unnecessary resistances caused by imperfect forms, and by inadjustability of form of the plow, a greater amount of labor than was wasted by the builder of the great Pyramid in Egypt, or in the building of the Chinese Wall. If all the soil thus removed were transported to the aggregate distance which it is transported and elevated to the aggregate height which it is elevated, in one heap, no one would dare to attempt the removal of the heap with no better implement than the plow.

Although 10,122 patents have been granted on the plow, in this country alone, it still offers a promising field for future inventors. The killing strain on the muscles of horses in starting street cars was not fully considered until the electric motor took the place of horses in street car work; then it was found that it required three times as powerful a motor to start a car as to run it after it was started. The loss of power in vehicles by sliding friction was not understood until the bicycle, propelled by human muscle, showed the utility of converting sliding into rolling friction by ball bearings, and the labor wasted in dragging the plow will never, perhaps, be rightly considered unless inventors themselves drag the plow, and inquire into the reasons and causes of the excessive effort required by this ancient and indispensable implement upon which all civilization depends. The horse and the mule cannot complain, and so the plow remains the plow, improved in material and in workmanship, but retaining many of the faults of the plow of our remote ancestors.

It would seem that agriculturists have to observe the working of the implements they use, to notice errors of construction, to study the conditions, and should have ability to suggest means of improvement. Singularly, very few cases are known where agriculturists have invented or improved their implements. More singularly, very few radical inventions or new departures have been made by men in their own lines of work. The machinist instinctively judges a suggested improvement in mechanics by what he has seen. The lawyer naturally tests innovations by past decisions. The physician unavoidably refers to his reading or practice for approval or condemnation of anything new in his line. The agriculturist can but seldom divest himself of preconceived notions. Morse, the inventor of the telegraph, was not an electrician; Watts, the inventor of the steam engine, was not a machinist. The list may be extended indefinitely. To make a new departure, a radical invention, seems to require an ingenious man, untrammeled, open to new ideas and approaching a subject from a new side. Ask an agriculturist how a plow may be improved, and instinctively his mind will picture a crooked thing of steel and wood, which is essentially what he has seen. There are few of us who are not mentally hide-bound, fewer still who do not travel in mental ruts. There are very few who do not inherit religions, or absorb politics from newspapers, or form associates or their ideas from those they admire, or their mechanical opinions from what they have seen, or read, or heard of.

The inventor who will furnish a superior substitute for the plow will probably not be a plowman. He will almost surely be poor, for rich men cannot invent. When an inventor becomes rich, which happens but rarely, his attempts at further invention are passing queer. He will meet opposition. Others will develop his invention and reap the reward, and long after he is dead a statue will be raised to his memory, and his name will appear in the list of benefactors of the race, though but few of the millions benefited by his work will know of him or his work, or will care to know.

If the statesmen of the present time, trained as they are in the acute political methods of the times, should imitate Jefferson and Webster, their illustrious predecessors, their names might go down to distant posterity in the list of those benefactors of the world—the "Improvers of the Plow."—La. Planter.

The Care Required in Loading an Ocean Liner.

To watch the loading of grain either from an elevator or lighter into one of the mammoth vessels engaged in its transportation, is to witness one of the chief operations in the movements of the world's commerce, says a writer in Donahoe's Magazine. It is carried in long pipes, with a funnel-shaped, movable appendage at the end, which is shifted by means of a rope from one part of the hold to another, according as the stream of grain fills up the spaces. It rushes into the vessel with the velocity of a torrent, and sends a dense volume of dust and chaff upward, obscuring the depths beneath, and making the men attending the stowage below look like ghosts in the rising mist.

The "trimming" of the grain in the holds is an important part of its storage. After several thousand bushels have streamed into the hold, a dozen or more men are delegated to shovel the downpouring column in between the vessel's beams, a job for which they are paid at the rate of one cent a minute. In vessels of the Cunard stripe, it takes between twelve thousand and fifteen thousand bushels to fill a hold, and these vessels average 50,000 bushels in the total cargo. Ships carrying grain alone can take as high as 125,000 bushels, and when it is considered that from 4,000 to 7,000 bushels can be stored in an hour, every forty bushels weighing a ton, an idea can be had of the force of the torrent directed into the vessel.

Large vessels have four or five holds, and a distinction is made in storing the cargo in them. Grain, from its compact and dead weight, is reserved mostly for the center of the vessel, while cured provisions are packed as far forward and as far aft as possible, for their better preservation from the heat of the ship's fires. In some vessels, like the great Cunarders, which carry passengers as well as freight, the heaviest weight is stored in the lowest hold; this is to steady the vessel. and is called in the technical parlance of the stevedore "stiffening" the ship. It takes about 1,500 tons to "stiffen" a great Cunarder, and when this is done the lower hold is fastened and battened down, and work is begun on the next.

Insects and Flowers.

No side of natural history is more curious than the relation between insects and the flowering of plants. In the primitive and simpler plants that live in the sea the male cells are discharged into the water and row themselves along by the screwing motion of minute bristles until they reach and fertilize the egg cells of the female. In many land plants the male cells, discharged as clouds of golden pollen, are blown about by the wind; myriads perish, but a few reach their goal, and, fertilizing the young egg cells, cause them to ripen into seeds. In many cases, however, Nature has curbed so reckless a prodigality, and the colors and scents of flowers are fruits of her parsimony. It may be laid down as a universal truth, to which the exceptions are only apparent, that plants bearing brightly colored or perfumed flowers require the aid of insects to fertilize them. The colors serve to attract the attention of insects; the scents, especially in flowers that blossom by night, serve the same purpose. The insects come for the store of honey, or for the pollen of the plants, and their return gift to the plants is that, flitting from blossom to blossom, they unconsciously carry the golden fertilizing grains from plant to plant.

For most flowering plants the visits of insects are a necessity. Let one but grow some common plant, like geranium or mignonette, under glass and muslin, so that no stray insect may reach them; the flowers will be formed, the perfume will be as sweet as usual, but the blossoms will fade without forming seeds. Many of our English flowers are capable of being fertilized only by one kind of insect. Thus, to choose a familiar instance, the common red clover is visited by the humble bee; the petals are fused together, forming a narrow tube surrounding the honey glands and the organs that form the pollen. The long proboscis of the humble bee is able to reach the deeply hidden stores; but the hive bee, whose tongue is shorter, though bidden to the feast by attractive color and smell, is perforce an inactive spectator. When clover was first grown in Australia it never seeded, and it was found that the tongues of the native bees were too short to reach the pollen. Still more often the gorgeous blossoms of the tropics remain sterile in England in the absence of the particular moth or fly to which they are adapted.

Sometimes, as Darwin showed in his fascinating volume on "The Fertilization of the Orchids," the devices to secure that an insect shall not visit a flower without coming in contact with the pollen are extraordinarily complicated. An insect alights on a gaudy and sweet smelling blossom. An inviting landing place is ready in the form of a conveniently placed floral leaf; but the thing is a trick. No sooner is the platform touched than it gives way with a jerk, precipitating the hapless insect into a well of fluid. His wings are wetted, and he has to crawl out slowly. But pointed bristles prevent exit except by a narrow funnel, and, as he squeezes through that, his back becomes dusted with the sticky pollen. In most plants, however, the lures are simpler, and are adapted to many different kinds of insects. In spring, when the fields are bare, the blues and whites of the early flowers are sufficient to attract the notice of the few insects on the wing. During summer, when the world is covered with green, more glaring contrasts come into play, and the bold masses of orange and gold, of crimson and pink, appear. It is curious, however, that scarlet, the most clamant of colors, is the rarest in Europe. In the tropics and in South America it is one of the most common, and it were worth inquiring if European insects be color blind to scarlet. At night, when crimson and blue, pink and orange, become invisible, pale yellows and luminous whites attract the night-flying insect by their phosphorescent radiance.

The scents of plants are almost more potent lures than their colors. At night they are naturally more varied and more potent. To drift in a backwater in a summer night, or to loiter in a wood, is to set one dreaming of the spices of the tropic isles. The scents of the day are shy and indistinct; only in the mass one notices them, as in passing through a bean field, or by a thicket of gorse. But at night each blossom that is not asleep sends out a clamorous and insistent odor, and at the same moment one notices a dozen distinct and striking perfumes. But, by day or by night, the scents are not all such as are pleasant to us. Some indeed are not even within our consciousness. Thus the flowers of the Virginian creeper are almost invisible; they have green corollas and are hidden under the foliage. To us they have no scent, yet bees come to them from great distances, and during their season they are always crowded with visitors. Some of the scents most dear to us are despised by many insects. Butterflies will pass honeysuckle itself, or, indeed, any flowers with a honeysuckle scent, unnoticed. At night, however, large hawk moths, by their attention to honeysuckle, show that they share our ideas of what is pleasant. Butterflies and bees, like ourselves, are unattracted by the carrion-like smell of many plants, but these latter are visited by many beetles and flies, to which the perfumes of the rose and the violet are unattractive.—London Saturday Review.

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

LIFTING JACK AND TRACK LINER.—Thomas McManus and George K. Smart, Atchison, Kansas. For conveniently and rapidly raising and shifting the rails and ties without injury to the track bed or track, these inventors provide a device consisting principally of a horizontal base or lining bar on which slides a hollow post or bar with or without roller bearings, a lifting bar adapted to support the rail sliding in the post. On the inside of the lifting bar, which carries a foot to support the base of the rail, are ratchet teeth engaged by a pawl having its pivot end in a recess in the lifting ram, which slides vertically in the lifting bar. For heavy tracks two jacks and track liners are preferably employed, the jacks being connected by a chain.

Electrical.

PUSH BUTTON.—Edwin A. Clark, Cleveland, Ohio. This button is made with a ferrule having an inwardly turned flange in which is a plug of insulating material carrying two contact points, a metallic cap with flaring sides having movement within the ferruleinside the flange, and being adapted to touch the contact and points, but being normally held away therefrom by a coiled spring resting on the insulating plug and pressing the cap outwardly. The device is very simple and inexpensive.

Mechanical.

PULLEY BLOCK.—Oliver Spitzer, Brooklyn, N. Y. To enable the operator to instantly lock the pulley or sheave, with the load suspended, or release the pulley when it is desired to hoist or lower the load, is the object of this invention. A star wheel on the pulley shaft is adapted for engagement by a pawl on one end of which is a shoulder against which a spring-pressed lever is adapted to abut, the lever being under the control of the operator, while a catch, also under the control of the operator, is adapted to engage the lever when its end is swung out of contact with the shoulder of the pawl. The device may be readily applied to any pulley block.

HAMMER. — Clarence McC. Eveleth, Plymouth, N. H. This is an improvement in hammers which have a claw for drawing nails, and provides a tool by which the nails may be drawn without marring the work and without bending the nails. A spring-pressed plunger, having a cushioned outer head, slides within a socket of the hammer head and a longitudinal recess in the handle, the plunger having notches or ratchet teeth on one side adapted for engagement by a spring latch when the plunger is withdrawn within the handle, or when it is in extended position, with its cushioned head bearing against the work.

BRICK OR TILE CUTTING MACHINE.—James C. Steele, Statesville, N. C. In this machine a cutter is movable transversely through the clay bar as it is fed out of the bar-forming mechanism, a support for the cutter being movable in the arc of a circle transversely to the clay bar, and there being mechanism for continuously reciprocating the support laterally and for oscillating the cutter at the necessary intervals. The machine is automatic in its operation, and the several parts are readily adjustable to cut the clay bar into different lengths.

SLATE DRESSING AND SIZING MACHINE.—Humphrey F. Morgan, Delta, Pa. In this machine a bed frame is movable vertically in guideways in a main frame, a toggle frame with which is connected a windlass shaft and lever supporting the bed frame. A carriage is movable on the bed frame, and independent weights are connected with and arranged to operate the carriage in reverse directions. The carriage is wide enough to permit several plates to be rested side by side thereon, and it is drawn under the polishing wheel as fast as the latter cuts its way on the surface of the slate, slates being ground or polished at each movement of the carriage back and forth.

CONTINUOUS CIGARETTE MACHINE.—Edward R. Colgin, Richmond, Va. This is a machine of simple and compact construction to which the loose tobacco is fed on endless aprons, and in which the filler rod-forming devices and the wrapping, and the pasting and cutting mechanism, are so arranged and connected as to positively and uniformly operate to form the cigarettes and cut them without reducing or marring the filler at the ends. There are also depositing and receiving devices whereby the cigarettes as they come from the machine are packed without any jar to cause the tobacco to crumble and drop out, making a bad-looking, unsalable article.

Agricultural.

PLOW.—William H. Mitchell, Glasgow, Ky. This is a combined right and left hand plow, the right and left hand point being carried by the same mould board upon a single standard, and one land side being used in connection with both points. The plow is capable of use on hill sides as well as upon level land, and is a right hand one going in one direction and a left hand one when traveling in the opposite direction, the change being brought about quickly by a reversal of the beam. Means are provided whereby the beam may be readily reversed upon the standard and held in any position necessary by a simple locking device.

GRAIN SEPARATOR.—Erastus E. Mendenhall, Thomasville, N. C. This is a machine especially adapted for separating wild onions, etc., which occasionally grow among wheat, from the wheat kernels. The machine has toothed and yielding surfaced separating cylinders between which the wheat and foreign substances are fed. the hard kernels of wheat being received in the elastic or flexible surface of the cylinder, while the soft foreign matters are taken up by the teeth of the separating roller or cylinder and carried to a separate chute from that in which the wheat is discharged.

Miscellaneous.

SAVING COAL DURING COMBUSTION.—David G. Stokey, Dallas, Texas. This invention provides a cheap and practical composition of ingredients for application to the fuel in a stove to intensify combustion, prevent clinkers, aid to burn the smoke, and effect a marked saving of the coal used as fuel. The composition consists of salt, charcoal, saltpeter, carbonate of zinc and borax, mixed in certain proportions with water and sprinkled on the coal. These ingredients, vaporized by the heat, assimilate with the carbon gas thrown off from the burning coal and render it more inflammable, thus effecting a more perfect combustion.

TREE SAWING MACHINE.—Frank Costa, Carbonado, Washington. This is a machine designed to saw standing trees. It has pivoted main and side bars, each with a device to secure it to a tree, a carriage on which is journaled a saw being slidable on the side bar, and a crank shaft on the carriage being geared to the saw, while gear wheels on the feed screw and the saw mandrel mesh with a gear wheel on the operating shaft, whereby the saw and its feed mechanism are simultaneously operated. The machine is so arranged that when used on a large tree it may be conveniently made to saw a kerf first on one side and then on the other.

WINDOW CURTAIN HANGER.—Charles M. Dilger and Henry Birnbaum, Rapid City, South Dakota. The hanger frame, according to this invention, is made in sections, adjustable one on the other, and with bearings for the roller, the frame being adapted to be raised or lowered on the window frame. By manipulating the cords the hanger may be raised or lowered to raise or lower the roller and the curtain or shade, so that light and air may be admitted directly through the upper sash.

KNOTTER AND BINDER.—Walter Connor, Toledo, Ohio. This is an improvement in devices for binding bundles and tying knots in the binding twine. It comprises a machine in which is a pivoted needle and a pivoted elbow lever, and a rod pivoted to both, there being a catch or holder on one end of a shaft on which is a pinion engaged by a rack on a tilting arm, a rod being connected to the tilting arm and elbow lever. The machine is hand operated, and facilitates the automatic tying of small bundles or packages, such as bunches of flowers, etc., the twine being severed after the knot is tied and a register made of the number of bunches tied.

POT. — Robert L. Steen, Lawrence, Kansas. In this pot it is designed to prevent all escape of steam, so that none of the valuable properties of the materials under treatment will be lost by escaping with the steam. A valve is made to close the spout, and weighted arms pivoted to the spout have their upper ends pivoted to the valve, stops secured to the spout limiting the outward swinging movement of the arms.

FINGER PROTECTOR.—Emma Grimes, Norfolk, England. This is a guard for the goods holding or guiding fingers in hand sewing. It is a tapered finger of soft rubber, having an opening at the finger tip, and an annular flange surrounding it, this end opening exposing a sensitive portion of the finger tip for use in manipulating the goods.

POLISH COMPOSITION. — William J. Birkenstock, New York City. This is a compound for polishing marble and other stones, one sufficiently fine and homogeneous to give a high polish and sharp enough to cause the polishing to be rapidly done, and intended to take the place of an ordinary grit. It is a composition in which are brass, lead, shellac and emery, prepared after a designated formula, and applied in the same manner as grit.

SURGEON'S TABLE.—Lyman G. Barton, Willsborough, N. Y. This table has independently movable leaves at opposite ends for the head and feet, and means for changing the angle of the table as a whole without altering the angle of the head and foot leaves in relation to the middle section; it also has various attachments for holding the limbs of a patient, and the parts of the table are very light and strong and readily separable. The table may be readily taken apart and folded in a very small compass.

VETERINARY APPLIANCE.—Joseph H. Gunning, New York City. This is a cannula designed to facilitate the breeding of a mare or other animal, and also affords an instrument which may be applied in the treatment of a wound.

RAT TRAP.—Joseph Klar and Frank H. Hall, Anna, Ill. This is an improvement on a formerly patented invention of the same inventors, and provides safeguards or locks of a simple form to prevent the animal when entrapped from leaving the compartment of the trap into which it may have entered. The invention affords a trap of inexpensive construction, and one in which the parts operate automatically.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

THE ORIGINS OF INVENTION. A study of industry among primitive peoples. By Otis T. Mason. With illustrations. London: Walter Scott, Ltd. New York: Charles Scribner's Sons. 1895. Pp. 419. Price $1.25.

No subject has taken a more pleasing aspect with the advance of science than has anthropology. The present charming work, based largely on the collections of the United States National Museum, cannot be too warmly commended, for the young and old alike. A deeply interesting portion of it is that devoted to the manufacture of stone implements and the tools of aboriginal workers. One interesting point brought out is that the old stone worker would throw away, after a few blows, as many as ten bowlders before he could get one which would suit him. The results of Mr. Holmes' investigations are given here, with full illustrations. The work is written on the principle of studying the past as largely as possible by the light of the present, thus making what might be a dry science one of the most vivid interest. The art of war seems somewhat insufficiently treated, the chapter being very short, and, curiously enough, the boomerang is entirely omitted; that is, as far as the index is concerned. On the whole, we feel that we cannot too warmly recommend the book.

HANDBOOK OF THE TURF, A TREASURY OF INFORMATION FOR HORSEMEN. Embracing a compendium of all racing and trotting rules; laws of the States in their relation to horses and racing; a glossary of scientific terms; the catch words and phrases used by great drivers, with miscellaneous information about horses, tracks, and racing. By Samuel L. Boardman. New York: Orange Judd Company. 1895. Pp. x, 303. Price $1.

It is well to know a little of everything, so it is fair to assume that this dictionary, which is an alphabetical cyclopedia, will receive a warm welcome from all interested in horsemanship. It seems as if the title hardly does it justice, as it really ought to be called a dictionary of equestrianism. In addition to the text proper, numerous quotations are given, and much specific information is printed in smaller type.

THE BUILDING OF A NATION. The growth, present condition and resources of the United States, with a forecast of the future. By Henry Gannett. New York: The Henry T. Thomas Company. Illustrated with maps, charts, and diagrams. 1895. Pp. xx, 252. Price $2.50.

The particular subject of this work is treated definitely from the standpoint of the statistician and census expert. There are very numerous plates conveying, by the census system of colored areas, the greatest variety of statistical information. Many maps are given of the United States, each for the purpose of indicating some specific series of data. The book really represents a small census provided with comments requisite to develop its full utility. It is based on the census of 1890 and, of course, much of its information refers to previous years as well. In order to make it an actual history, the total rural and urban population of each census is carried back to the last century, and many of the tables of data begin in 1790 and end with 1890. Eleven different censuses, therefore, are made tributary to the volume. The table of contents and index leave nothing to be desired.

"The Bachelor of Arts" is the title of a new monthly magazine devoted to university interests and general literature. John Seymour Wood is the editor and Walter Camp and Edward S. Martin are associate editors, Henry G. Chapman, of No. 15 Wall Street, New York, being the business manager. The "advisory board" exhibits a long list of distinguished names from twenty-five different colleges and universities, and contributions to its pages are expected from many eminent writers. Typographically the new magazine is quite unique in its appearance, and its form is such that it may be readily carried in the pocket.

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(6560) W. H. K. says: Please advise through Notes and Queries, SCIENTIFIC AMERICAN, how to fasten rubber rollers used on clothes wringers which have been turned loose from shafts. A. 1. Clean shaft thoroughly between the sholders or washers, where the rubber goes on. 2. Give shaft a coat of copal varnish, between the shoulders, and let it dry. 3. Give shaft coat of varnish and wind shaft tightly as possible with 5 ply jute twine at once, while varnish is green, and let it dry for about six hours. 4. Give shaft over the twine a coat of rubber cement, and let it dry for about six hours. 5. Give shaft over the twine a second coat of rubber cement, and let it dry for about six hours. 6. Remove washer on the short end of shaft, also the cogwheel, if the shaft has cogs on both ends. 7. See that the rubber rolls are always longer than the space between the washers where the rubber goes on, as they shrink or take up a little in putting on the shaft. 8. Clean out the hole or inside of roll with benzine, using a small brush or swab. 9. Put the thimble or pointer on the end of shaft that the washer has been removed from, and give shaft over the twine and thimble another coat of cement, and stand same upright in a vise. 10. Give the inside or hole of roll a coat of cement with a small rod or stick. 11. Pull or force the roll on the shaft as quickly as possible with a jerk, then rivet the washer on with a cold chisel. 12. Let roll stand and get dry for two or three days before using same. Cement for use should be so thick that it will run freely; if it gets too thick, thin it with benzine or naphtha.

(6561) G. S. W. says: 1. Give formula for making a washing compound. A. A washing powder for the finest white linen is a powdery mixture of 90 parts effloresced soda with 10 parts of hyposulphite of soda and 2 parts of borax. 2. I want to manufacture a stove paste polish that is odorless and dustless and has good lasting qualities. A. Plumbago, 2 lb.; water, 8 oz.; turpentine, 8 oz.; sugar, 2 oz. Knead thoroughly and keep in tin boxes. Apply with a brush. 3. A recipe for making a good silver polish. A. Silver Polishing (Putz) Pomade.—Mix thoroughly 4½ parts vaseline with a few drops of essence of mirbane (nitrobenzole). Add to this by stirring 7½ parts elutriated chalk, 1½ parts burnt hartshorn, 1½ parts pulverized ossa sepia (cuttle bone). The mixture should be of the consistency of butter.

(6562) A. M. says: I would request you to send me a receipt for making condensed milk. A. Condensed milk is made by boiling milk in condensing pans in which the atmospheric pressure is removed. The process is described in detail in the SCIENTIFIC AMERICAN for July 12, 1890, April 19, 1884, July 13, 1889, and in SUPPLEMENT, No. 156.

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SCIENTIFIC AMERICAN BUILDING EDITION.

JUNE, 1895.—(No. 116.)

TABLE OF CONTENTS.

1. A cottage at Bronxwood Park, Williamsbridge, N. Y., recently erected for Dr. Geo. P. Shirmer, at a cost of about $2,500. Perspective elevation and floor plans. A pleasing design. A. F. Leicht, Esq., architect, New York City.
2. An elegant plate in colors showing a cottage at Bronxwood Park, Williamsbridge, N. Y., recently erected at a cost of $2,200. Perspective view and floor plans. Mr. A. F. Leicht, architect, New York City. A neat design.
3. A cottage at Flatbush, L. I., recently erected for W. K. Clarkson, Esq., at a cost of $5,000. Perspective elevation and floor plans. Mr. Christopher Myers, architect, New York City. A picturesque design.
4. A modern cottage at Bedford Park, New York City, recently erected at a cost of $3,000. Perspective elevation and floor plans. A picturesque design. Mr. Edgar K. Bourne, architect, New York City.
5. The Bedford Park Congregational Church. Two perspective elevations and floor and basement plans. Cost complete, $7,000. Mr. Edgar K. Bourne, architect, New York City.
6. A Colonial cottage recently erected at New Dorp. S. I., at a cost of $3,675, complete. Perspective elevation and floor plans. Messrs. Child & De Goll, architects, New York City. An attractive design.
7. A residence at Germantown, Pa. Two perspective elevations and floor plans. Cost complete, about $10,500. Messrs. Child & De Goll, architects, New York City.
8. The New Theater, San Luis de Potosi, Mexico. Architect, Don Jose Noriega.
9. Design for a window decoration.
10. The residence of E. P. Sandford, Esq., at Montclair, N. J. Two perspective elevations and floor plans. An elegant design. Architect and builder, Mr. E. P. Sandford, Montclair, N. J.
11. A cottage in the English half-timbered style recently erected for F. E. Kirby, Esq., at Glen Ridge, N. J. Perspective view and floor plans. E. Rollin Tilton, designer, New York City.
12. Miscellaneous contents: The Hanging Gardens of Babylon.—Perspective drawings.—Concrete roofs.—Points of support.—Architects' estimates.—An improved hot water heater, illustrated.—A new invention for raising water, illustrated.—Improved paving.—The Bommer spring hinge, illustrated.—A mixing regulator for gas machines, illustrated.—Adjustable sliding door track and hanger, illustrated.—Woodworker's improved vise, illustrated.—African mahogany.—A new steam and hot water heater, illustrated.—Powers' improved automatic chimney top, illustrated.—Improved wood working machinery, illustrated.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

June 18, 1895,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Adjustable chair, F. C. Price ... 541,249
Air ship, cable, J. T. Lomax ... 541,102
Antifriction block, G. M. Mullen ... 541,331
Arc lighting, S. W. Rushmore ... 541,290
Armature for electric motors and generators, J. F. McLaughlin ... 541,380
Ash box, P. Everitt ... 541,449
Autoharp, Govan & Worton, Jr ... 541,352
Bag. See Mail bag. Traveling bag.
Balance, C. N. Fenner ... 541,434
Baling press, Livengood & Mason ... 541,370
Band cutter and feeder, R. Johnson ... 541,296
Barrel making machine, A. B. Miner ... 541,246
Bath or other tub, C. E. Marston ... 541,371
Bath tub, etc., Clifford & Sutter ... 541,068
Battery. See Storage battery.
Battery cell, portable galvanic, F. A. Glasgow ... 541,350
Bean scourer and cleaner, J. Skinner ... 541,185
Bearing, antifriction, W. H. Wright ... 541,196
Bearing for vehicle wheels, ball, E. A. Jones ... 541,237
Bearing, step, B. D. Whitney ... 541,303
Bedstead attachment, G. W. Thompson ... 541,339
Berry picking machine, A. H. & A. H. Bassett, Jr ... 541,307
Beverages, effervescing mixture for, R. Wichmann ... 541,255
Bicycle change gearing, V. Belanger ... 541,260
Bicycle gearing, O. F. Good ... 541,270
Bicycle pedal, H. F. Kendall ... 541,238
Bicycle rim, W. H. & C. Roehr ... 541,119
Blackboard, annunciating, J. E. Wenger ... 541,403
Bleaching process and apparatus, H. Blackman ... 541,147
Block. See Antifriction block.
Blotter for blankbooks, removable, J. D. Mets ... 541,108
Bobbin holder and thread catcher, T. J. Murdock ... 541,377
Boiler. See Sectional boiler. Steam boiler.
Boiler cleaner, I. C. Gray ... 541,272
Boiler furnace, steam, A. Wilkinson ... 541,405, 541,448
Book, account, E. H. Doan ... 541,430
Bottle, J. H. Valentine ... 541,133
Box. See Ash box. Display box. Match box.
Box trimming machine, H. W. Morgan ... 541,376
Bracket. See Shelf bracket.
Brake. See Car brake. Pressure brake. Vehicle brake.
Brake shoe, M. T. A. Kubierschky ... 541,099
Bridge construction, C. H. Platt ... 541,213
Bridle bit, G. W. & A. E. Ives ... 541,279
Brush, rotary hair, E. I. Busby ... 541,065
Brush wiper, F. L. Clarke ... 541,224
Buoy for locating wrecks and attaching lines thereto, F. Canney ... 541,313
Buoy, life, F. Barathon, Aine ... 541,340
Burner. See Gas burner. Oil burner.
Bushing and stopper, bung, B. Rubenstein ... 541,122
Button backing machine, pearl, S. Nachtigal ... 541,382
Calcium carbide process, T. L. Willson ... 541,137
Calcium carbide, product existing in form of crystalline, T. L. Willson ... 541,138
Calculator, mechanical, C. C. Kennison ... 541,361
Camera. See Magazine camera. Roll holding camera.
Can. See Cooling can. Self-opening can.
Car brake, electric, G. B. Damon ... 541,073
Car cinder dust guard, Amann & Thomas ... 541,144
Car coupling, J. T. Crews ... 541,315
Car coupling, V. Erbach ... 541,432
Car coupling, C. A. Tower ... 541,400, 541,401, 541,446
Car coupling, automatic, L. O. Lecompte ... 541,329
Car draught rigging, railway, W. Stephan ... 541,129
Car fender, J. L. Canham ... 541,312
Car fender, A. Decker ... 541,268
Car fender, J. Nagele ... 541,383
Car fender, safety, G. P. Kato, Jr ... 541,282
Car protector, C. G. Ingalls ... 541,327
Car register, street, O. E. Michaud ... 541,373
Car, street, F. A. Baier ... 541,415
Cash register and indicator, J. P. Cleal ... 541,264
Chair. See Adjustable chair.
Chamber vessel attachment, G. M. G. Weston ... 541,219
Change handling device, G. E. Crump ... 541,267
Checkrein loop, H. H. Baker, Jr ... 541,258
Child's hoop, F. W. Andrus ... 541,413
Churn, Maddox & Dunlap ... 541,173
Churn power, J. T. Gilbert ... 541,437
Cigar stamping die, E. N. Cusson ... 541,226
Cigarette machine, continuous, H. Korte ... 541,364
Clipping machine, animal, J. W. Newall ... 541,288
Clock, C. A. Jacques ... 541,207
Clothes line fastener, C. L. Feinberg ... 541,348
Clothes rack, W. A. Bode ... 541,309
Clutch, C. B. Rumsey ... 541,444
Coal washer, G. E. Giles ... 541,324
Coat pad, S. Dreyer ... 541,079
Coffee huller, J. Reimers ... 541,250
Collar fastener, horse, J. H. Emerson ... 541,347
Column, illuminated, C. Sieburg ... 541,337
Comb, W. H. Cushing ... 541,315
Compound wound alternating generator, J. D. Hilliard, Jr ... 541,357
Concentrator, J. H. Glasmann ... 541,202
Controller handle, C. L. W. Bischoff ... 541,419
Conveyer, McIntyre & Kessel ... 541,112
Cooker, steam, G. A. Swartwout ... 541,397
Cooler. See Corpse cooler.
Cooling can, liquid, W. F. E. Casse ... 541,343
Coping head and bit, J. Kuehnle ... 541,100
Corpse cooler, J. Stanton ... 541,296
Cot, extensible, J. C. Figel ... 541,157
Cotton compress, roller, C. L. Bessonette ... 541,418
Coupling. See Car coupling.
Cranberry picker, J. M. & S. B. Moody ... 541,109
Crossing, highway, J. H. Ring ... 541,181
Cultivator for listed corn, E. E. Hartzell ... 541,230
Cultivator tooth, E. A. Ovensbire ... 541,177
Current strength indicator, P. G. Burgess ... 541,148
Curtain fixture, C. O. Dutcher ... 541,153
Cutter. See Band cutter. Hay, straw, or fodder cutter. Meat or vegetable cutter.
Cyanides, making, H. Y. Castner ... 541,066
Cyclometer, W. S. Bigby ... 541,452
Damper, A. S. Held ... 541,162
Dash pot, F. W. Gordon ... 541,351
Dating and numbering device, W. Murphy ... 541,247
Dental tool holder, G. W. Nutz ... 541,211
Die. See Sectional die.
Dies, apparatus for making, Hoff & Pickles ... 541,438
Digging machine, trench, G. D. Gunn ... 541,229
Display box, J. A. McDonald ... 541,111
Door, J. A. Crismore ... 541,316
Door closing mechanism, W. Stephan ... 541,295
Door fastener, sliding, F. A. Winslow ... 541,139
Door, solid or veneered, F. F. Wright ... 541,450
Draught equalizer, O. & F. Zoeller ... 541,198
Draughting apparatus, garment, F. E. Buddington ... 541,311
Dredger, A. F. Carroll ... 541,223
Drill. See Grain drill.
Drilling apparatus, J. F. Willard ... 541,256
Drilling machine, multiple, S. Nachtigal ... 541,381
Egg poacher, M. F. Henderson ... 541,205
Electric elevator, R. Eickemeyer ... 541,200
Electric switch, C. P. Elieson ... 541,227
Electrical distribution system, C. K. Huguet ... 541,233
Electricity to lamps, etc., device for conducting, G. F. Rose ... 541,121
Electrolytic process and apparatus, H. Blackman ... 541,146
Elevator. See Electric elevator.
Elevator door, T. F. Sanford ... 541,292
Engine. See Rotary engine.
Engines, electric stop motion for, Myrick & Doeg ... 541,287
Excavating machine, C. A. Warren ... 541,193
Exhibiting device, Ethier & Bauch ... 541,433
Extractor. See Nail extractor.
Extracts, apparatus for obtaining, W. Albach ... 541,410
Eyelets, F. F. Hawkins (r) ... 11,500
Fan, H. Scheuer ... 541,392
Fan, pendulum, Baumgartner & English ... 541,061
Fare receiver, and automatic change maker, H. M. Sturgis ... 541,299
Feathering device, R. E. Terry ... 541,398
Fence, H. Crisler ... 541,453
Fence post, R. B. Robbins ... 541,214
Fence stay, wire, J. R. Ault ... 541,414
Fence stretcher, wire, C. M. Lamb ... 541,240
Fence, wire, I. F. Ebert ... 541,154
Fence, wire, W. A. Sprague ... 541,128
Fence, wire, I. H. Swink ... 541,131
Fence wire compensator, H. C. Schweickart ... 541,184
Fermenting trap, E. Marquardt ... 541,443
Fertilizer distributer, E. B. Barnhill ... 541,417
File, newspaper, J. Rischert ... 541,391
File, paper, A. Dom ... 541,319
Filter, C. M. Bump ... 541,342
Filter, water, C. M. Schermerhorn ... 541,183
Filtering apparatus, oil, H. Hubbard ... 541,439
Fire escape, G. W. Root ... 541,120
Fire igniter, J. W. Walles ... 541,302
Fires, composition of matter for kindling, W. E. Hoover ... 541,358
Fireman's protector, G. O. Adicks ... 541,059
Fish and fish offal, apparatus for treating, J. C. W. Stanley ... 541,187
Fishing device and signal, O. Hartmann ... 541,354
Fishing reel, automatic, H. S. Stebbins ... 541,394
Flashing light apparatus, automatic regulating device for, F. A. E. Lechner ... 541,242
Frames, locking brace for folding, M. M. Flynn ... 541,083
Friction drum, J. V. Beekman ... 541,308
Fruit picking machine, A. Wyble ... 541,142
Fuel compressing machine, T. M. Cochrane ... 541,069
Fuel, process of and apparatus for combustion of, W. Black ... 541,063
Fumigator for insects, W. A. Hammer ... 541,086
Furnace. See Boiler furnace. Melting furnace.
Furnace grate, H. Truesdell ... 541,189
Gallows, automatic, J. L. Woodbridge ... 541,409
Game apparatus, C. H. Buxton ... 541,150
Game apparatus, E. A. Farish ... 541,155
Game apparatus, parlor baseball, F. W. Rahmer ... 541,387
Gas, apparatus for manufacture of, L. L. Merrifield ... 541,107
Gas, apparatus for production of, E. N. Dickerson ... 541,427
Gas burner for stoves or furnaces, Pettibone & Loomis, Jr ... 541,212
Gas governor, J. G. Smith ... 541,127
Gas holder relief valve, automatic, E. N. Dickerson ... 541,428
Gas making apparatus, means for supplying oil to superheaters in, W. H. Pearson, Jr ... 541,116
Gas, process of and apparatus for producing, E. N. Dickerson ... 541,429
Gas producing apparatus, E. J. Jerzmanowski ... 541,092
Gate, D. Rudy ... 541,289
Gear wheel, differential, C. J. Paulson ... 541,385
Gluing machine, Mabin & Munger ... 541,103
Gold and silver from their ores, extracting, E. B. Mierisch ... 541,374
Gold and silver, separating, F. Rinder ... 541,333
Grain drill, G. W. Kirkpatrick ... 541,362
Grain drill gearing, F. A. Rice ... 541,251
Grain scourer, W. W. Huntley ... 541,235
Grate for cooking stoves, etc., oscillating, Kaempen, Jr., & Wewers ... 541,359
Grinding and polishing machine, F. N. Gardner ... 541,349
Gun, air, G. P. Gunn ... 541,085
Hair structure, A. Simonson ... 541,125
Hand or book rest, H. C. Thiemann ... 541,254
Handle. See Controller handle. Tool handle.
Hanger. See Trousers hanger.
Harrow and cultivator tooth, S. N. Park ... 541,178
Harvester attachment, A. J. Johnson ... 541,093
Harvester picking mechanism, cotton, G. Beekman ... 541,062
Hay rake, horse, L. H. & O. N. Kimball ... 541,169
Hay, straw, or fodder cutter, J. Laughlin ... 541,284
Heater. See Tank heater.
Hides or skins, machine for buffing or shaving, J. Boyle ... 541,262
Hoist, hog, O. P. Hurford ... 541,278
Hoisting or lowering apparatus, P. Rahm ... 541,386
Hoop. See Child's hoop.
Hop picker, C. E. Easton ... 541,431
Horseshoer's stand, D. Menard ... 541,105
Huller. See Coffee huller.
Indicator. See Current strength indicator.
Injector for liquid fuel, etc., W. Dandison ... 541,074
Insulator, J. M. Patterson ... 541,332
Jack. See Lifting jack.
Journal lubricator, A. W. Wright ... 541,197
Kiln, Galloway & Leary ... 541,436
Kiln, W. J. Thomas ... 541,218
Kitchen cabinet, M. H. Shanley ... 541,216
Knitting machine bar or cylinder, L. N. D. Williams ... 541,406
Knitting machine, circular, B. M. Denney ... 541,425
Knitting machines, extra thread feeding device for, L. N. D. Williams ... 541,407
Knitting machines, striping attachment for latch needle rotary, J. Forman ... 541,084
Knob spindle fastener, C. R. Uhlmann ... 541,132
Lamp, cycle, H. Lucas ... 541,172
Lamp, electric arc, C. A. Pfluger ... 541,179
Lamps, wick adjusting device for central draught, A. H. Jones ... 541,281
Last heels, machine for shaping, A. G. Fitz ... 541,158
Lathe, wood turning, D. Hepp ... 541,275
Lifting jack, J. W. Currier ... 541,345
Lock, Swelgart & Oberholtzer ... 541,454
Logging car load releaser, E. Badin ... 541,220
Lubricator. See Journal lubricator.
Lubricator, C. Heinrich ... 541,355
Magazine camera, H. Smyth ... 541,186
Magazine plate holder, A. Tournier ... 541,188
Mail bag, M. G. Knight ... 541,097
Malt extract and making same, caramelized, J. F. Theurer ... 541,300
Match box, C. & A. Hersbey ... 541,232
Match box, Sackwitz & Schubert ... 541,124
Matrix making machine, T. C. Hargrave ... 541,161
Measuring device and faucet, L. & V. Konopinski ... 541,363
Meat or vegetable cutter, D. & D. H. Martin ... 541,245
Mechanical movement, A. M. C. F. Aubert ... 541,257
(Medical.) Precipitating blood by pyrogallic acid, E. R. Kobert ... 541,096
Melting furnace, S. T. & C. H. Wellman ... 541,402
Metallic plate, hardened, J. H. Carpenter ... 541,422
Mining machine, L. W. Le Grand ... 541,171
Mining machine, J. A. Wiggs, Jr ... 541,134
Moulding machine, H. C. Duggan ... 541,080
Mower, lawn, H. L. Freeman ... 541,082
Musical instrument plate, B. Ruckert ... 541,123
Nail extractor, M. D. Converse ... 541,071
Nailing machine, hand, G. W. Heird ... 541,088
Napkin holder, B. F. Pascoe ... 541,384
Numbering machine, Reinhardt & Sanders ... 541,180
Numbering machine, F. Sanders ... 541,182
Nut lock, F. Comminge ... 541,070
Nut lock, L. Fleischman ... 541,159
Oil burner, E. C. Broadwell ... 541,310
Oil burner, F. E. Keefe ... 541,168
Operating table, H. A. Kaysan ... 541,360
Oven doors, counterbalancing device for, J. E. Hunter ... 541,234
Packing, flexible joint, J. L. Holland ... 541,164
Pad. See Coat pad. Stair pad.
Papermaking machine, T. H. Savery ... 541,336
Paper roll holder, D. F. Walker ... 541,192
Pavement, street, W. H. Winslow ... 541,140
Perforating tool or machine, A. G. P. Ebert ... 541,199
Piano music desk, K. A. Modee ... 541,375
Picker. See Cranberry picker. Hop picker.
Pill machine, E. L. Richards ... 541,390
Pipe. See Tobacco pipe.
Pipe sleeve, steam, W. J. Frost ... 541,322
Pipe wrench, chain, E. S. Hunter ... 541,166
Plant support, W. A. Mills ... 541,285
Planting machine wheel, corn, R. S. Kirkpatrick ... 541,095
Pliers and staple puller, combination cutting, J. G. Davis ... 541,076
Plow, Allerton & Weed ... 541,411
Plow, D. S. Ruley ... 541,252
Pocket device, H. M. Moore ... 541,110
Polishing machine, J. D. Carey ... 541,314
Post. See Fence post.
Power. See Churn power.
Preserving apparatus, food, M. Leak et al ... 541,368
Press. See Baling press.
Pressure brake, fluid, A. M. Mentzer ... 541,372
Printer's quoin, A. S. N. Olson ... 541,115
Printer's rule, L. Quellmalz ... 541,117
Printing machine, C. P. Cottrell ... 541,266
Printing machine, E. H. Cottrell ... 541,265
Projectile with detachable soft cap, E. M. Johnson ... 541,280
Pump, J. A. Henry ... 541,206
Pump or turbine, rotary, O. Reynolds ... 541,455
Push button, F. W. Manger ... 541,243
Puzzle, F. P. Davis ... 541,424
Rack. See Clothes rack.
Rail bond, Baker & Brinckerhoff ... 541,259
Railway, electric, R. M. Hunter ... 541,165
Railway switch, electric, L. Wheeler ... 541,194
Railway switch, overhead, E. Langen ... 541,365, 541,366
Railway switch, street, G. Borgeson ... 541,421
Railway tie and fastening, L. Golder ... 541,325
Railways, electric alarm signal and indicator for trolley, J. A. Buisson ... 541,341
Railways, underground closed conduit system for electric, A. J. Smith ... 541,338
Rake. See Hay rake.
Register. See Car register. Cash register.
Register, J. P. Hallenbeck ... 541,204
Repeater, M. G. Crane ... 541,225
Rheostat or other circuit controller, C. Willms ... 541,136
Roll holding camera, Crane & Hickman ... 541,423
Rotary engine, J. W. Blount ... 541,064
Rug fastener, S. B. Donchian ... 541,320
Safety switch, J. C. McCarthy ... 541,176
Sail, N. G. Herreshoff ... 541,231
Saw frame, hack, C. Luke ... 541,442
Sawmill, reciprocating, C. W. Garland ... 541,160
Sawing, grooving, etc., machine for, H. W. Hutchins ... 541,167
Scaffolding, H. Gewiss ... 541,323
Scourer. See Bean scourer. Grain scourer.
Screw cutting tool, G. S. Long ... 541,209
Sealing device, bottle, R. A. Hall ... 541,203
Seaming tool, roofer's, W. L. & H. Heberling ... 541,087
Sectional boiler, H. D. Rogers ... 541,118
Sectional die, F. P. Arnold ... 541,306
Self-opening can, Norton & Larkin ... 541,248
Separator. See Steam separator.
Sewer trap, C. Knispel ... 541,208
Sewing machine, Merrow & Collins ... 541,106
Shade, window, J. Eckert ... 541,346
Shafting flexible, N. Stow ... 541,297
Shears, H. V. Smith ... 541,294
Shelf bracket, J. B. Nolan ... 541,114
Shelving, library, G. Stikeman ... 541,395
Ships' bottoms, means for prevention of fouling of, J. Yorke ... 541,451
Ships' bulkheads, double door for, M. Stuhler ... 541,253
Show boxes, folding shelf for paper, C. Arnold ... 541,060
Shutter operating device, W. H. Ackerman ... 541,058
Sifter, ash, O. Althin ... 541,143
Signal. See Train signal.
Skins, machine for opening, P. Young ... 541,304
Skirt, bicycle riding, A. B. Galloway ... 541,435
Soldering iron, R. McShane ... 541,210
Soldering torches, acid bottles, and blowpipes, device for combining, R. A. Willson ... 541,408
Spacer for line-casting machines, A. W. Hanigan ... 541,353
Spinning machine, J. Good ... 541,271
Spools or bobbins, apparatus for making, McCrossan & Paul ... 541,379
Sprigging or nailing machine, T. Gare ... 541,201
Square, bevel, C. A. Carlson ... 541,151
Stair pad, Marcus & Collins ... 541,244
Stamp canceling and postmarking machine, G. W. Hey ... 541,163
Stamp canceling machine, M. J. Dolphin ... 541,078
Steam boiler, J. F. Laidlaw ... 541,239
Steam boiler, water tube, I. M. Moyes ... 541,330
Steam separator, J. L. Hrnig ... 541,277
Steering apparatus, vessel, Moore & Megarvey ... 541,286
Stenographic machine, J. W. & J. K. Bailey ... 541,416
Stereotype matrices, machine for making, J. Rupertus ... 541,445
Stone channeling machine, A. Ball ... 541,221
Stone grooving tool, Dudley & McCaskey ... 541,321
Stone, ore, etc., apparatus for breaking or crushing, C. W. Thompson ... 541,399
Stop mechanism, automatic, G. S. Hill ... 541,276
Storage battery and making same, N. H. Edgerton ... 541,081
Stove or range fire-backs, heat barrier plate for, W. Wewers ... 541,404
Stovepipe shelf, J. Allingham ... 541,412
Switch. See Electric switch. Railway switch. Safety switch.
Switch tongue operating mechanism, P. H. Smith ... 541,393
Table. See Operating table.
Tables, chairs, etc., adjustable support for, H. G. Leisenring ... 541,369
Tack, plumber's, E. Rookhout ... 541,420
Tank heater, H. L. Ferris ... 541,269
Telephone circuit conductors, distributing frame for, F. B. Cook ... 541,152
Telephone system, W. W. Dean ... 541,077
Thermocauter, J. E. Lee ... 541,441
Thrashing machine, F. F. Landis ... 541,101
Thrashing machine shoes, adjustable attachment for, J. E. Wolf ... 541,195
Ticket, mileage, C. W. Reiff ... 541,388
Timber and lumber conveyer, J. F. Hostetter ... 541,089
Tire for vehicle wheels, pneumatic, J. F. Ives ... 541,091
Tire, pneumatic, C. H. Davids ... 541,075
Tire tightener, J. N. Jennings ... 541,328
Tire tightener, J. W. Johnson ... 541,440
Tire, vehicle wheel, Sulley & Dowson ... 541,396
Tobacco casing and flavoring machine, J. H. Kester ... 541,283
Tobacco curing barn, J. L. Adams ... 541,305
Tobacco pipe, D. H. Ferguson ... 541,156
Tool handle, W. B. Swan ... 541,130
Toy cannon, C. M. Van Buren ... 541,191
Track sanding apparatus, J. A. Houston ... 541,090
Train signal, electric, E. J. Devine ... 541,389
Transmitter, J. Burry ... 541,149
Trap. See Fermenting trap. Sewer trap.
Traveling bag, W. F. Williams ... 541,135
Trimmings, forming, L. S. May ... 541,104
Trolley wheel, C. Smith ... 541,126
Trolley wire crossing, J. Kroger ... 541,098
Trousers, bicycle, H. J. Roschi ... 541,334
Trousers hanger, F. S. Smith ... 541,293
Truck bolster, car, E. F. Goltra ... 541,326
Truss, electric, B. R. Lathrop ... 541,367
Tub. See Bathtub. Bath or other tub.
Tube making machine, C. M. Clarke ... 541,067
Typesetting machine, F. O. Stuart ... 541,217
Typewriting machine, T. Cahill ... 541,222
Typewriting machine, W. M. Jenne ... 541,113
Unicycle, E. N. Higley ... 541,356
Valve for air brakes, triple, Milne & Greene ... 541,175
Valve for cans, automatic, Bradish & Fitzsimmons ... 541,263
Valve gear, E. Salzer ... 541,291
Vaporizer for moistening air, O. B. Truesdell ... 541,190
Vehicle brake, H. C. Chamberlin ... 541,344
Vehicle, traction, H. Detreux ... 541,426
Vending and money-changing machines, combined automatic, H. M. Sturgis ... 541,298
Vending machine, T. Lassen ... 541,241
Vessels, apparatus for raising sunken, A. G. Mid-ford ... 541,174
Wagon, dumping, R. F. King ... 541,170
Wagon or cart, chute, J. McBride ... 541,378
Wagon rod, D. W. Johnson ... 541,094
Washing machine, Frank & Weibe ... 541,228
Water closet, J. H. Hamilton ... 541,274
Water closet flushing device, W. Scott ... 541,215
Water closet water supplying apparatus, J. L. S. Connolly ... 541,072
Water, process of and apparatus for disinfecting and purifying, C. Salzberger ... 541,335
Wheel. See Gear wheel. Planting machine wheel. Trolley wheel.
Wind mill, H. H. Velie ... 541,301
Window, swinging, C. M. Berry ... 541,261
Wire fastener and stretcher, U. A. Gregg ... 541,273
Wrapping machine, newspaper, J. Arnott, Jr ... 541,145
Wrapping machine, newspaper, Davies & Thomas ... 541,318
Wrapping machine, rotary, D. Wrigley ... 541,141
Wrench. See Pipe wrench.
Zinc slimes, reducing, Watts & Coan ... 541,447

DESIGNS.

Badge or pin, M. W. McCastline ... 24,396
Baking pan, N. H. Mims ... 24,407
Bottle, A. C. Alexander ... 24,400
Box cover, M. Ernst ... 24,409
Buckle slide frame, A. J. Hayden ... 24,399
Candlestick, W. Varney ... 24,401
Carpet, A. F. Reddie ... 24,413 to 24,415
Carpet, A. M. Rose ... 24,416
Hook, A. Johnson ... 24,406
Hoop, F. C. Bates ... 24,405
Lamp, G. Siebrecht ... 24,402
Mirror frame, P. Wiederer ... 24,404
Picture frame, A. Lederer ... 24,403
Plate, R. B. Hansell ... 24,410
Pump air chamber, P. F. Lewis ... 24,411
Spoon, fork, etc., M. W. McCastline ... 24,397
Stove or range, Bascom & Ambrose ... 24,408
Trap and basin standard, O. Marschuetz ... 24,412
Watch bow, C. L. Depollier ... 24,398

TRADE MARKS.

Antiseptic powder, Clark-Otis Chemical Company ... 26,712
Beverages and aerated drinks, preparation used in making, W. Duckworth ... 26,706
Bitters and tonics, F. Bisleri & Company ... 26,707
Boilers, fluid for prevention of corrosion and pitting in steam, Zynkara Company ... 26,713
Boots, shoes, and leather for uppers of same, Isaac Prouty & Company ... 26,698
Braids, plain, A. H. Rice & Company ... 26,697
Bread, O. G. Petterson ... 26,702
Candy and chewing gum, chewing, A. J. Chapman & Company ... 26,703
Carbons for electrical purposes, H. Reisinger ... 26,714
Cigars and cigarettes, Manchester Cigar Manufacturing Company ... 26,704
Disinfectants and deodorizers, Royal Cross Chemical and Odorless Cabinet Company ... 26,711
Extracts, essences, tinctures, and perfumer, McKey & Company ... 26,699
Harps, Flagg Manufacturing Company ... 26,720
Photography, chemicals for use in, E. & H. T. Anthony & Company ... 26,715
Pulleys and coverings therefor, Jewell Belting Company ... 26,718
Remedies, certain named, A. H. Meuly ... 26,709
Remedies for headache and neuralgia, G. F. Mason ... 26,710
Remedies for skin diseases, obesity, and like troubles, Columbia Chemical Company ... 26,708
Soap, laundry or washing, Mendenhall & Son ... 26,701
Soap, perfumery, cosmetics, hair restoratives, and lotions, toilet, Sylvan Toilet Company ... 26,700
Thread, silk, M. Heminway & Sons Silk Company ... 26,696
Tobacco, cigars, cigarettes, and snuff, E. J. Lusby ... 26,705
Wall coatings and finishes, Muralo Company ... 26,717
Wool and steel shavings for cleaning and polishing purposes, A. Buhne & Company ... 26,716
Wringers, American Wringer Company ... 26,719

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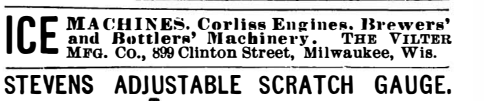

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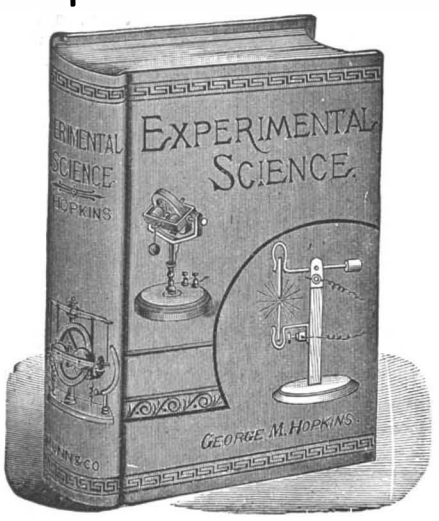

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ILLUSTRATIONS.

A

Academy of Sci., New York..... 233
Acetylene apparatus..... 203
Action, piano, frame, Bothmer.. 404
Adjuster, brake slack..... 405
Alpaca, the 265
Amalgamator, ore..... 36
Ampere meter, Bristol's..... 190
Animals, interesting..... 265
Ant eater, porcupine..... 265
Antelope, Koodoo..... 377
Arch, memorial, Brooklyn..... 11
Arch, triumphal, Roman 117
Atlanta exposition..... 165
Auto-phoro-optometer 171

B

Banyan tree, pagoda in..... 89
Battery, Capo-farad..... 43
Batteries, storage, charging..... 87
Battle ship Indiana..... 8
Battle ship Oregon 353
Berths, pneumatic 43
Bicycle brake, pneumatic..... 59
Bicycle exhibition, New York.... 81
Bicycle frame..... 106
Bicycle holder 73
Bicycle improvements..... 373
Bicycle, Keating..... 106
Bicycle, nautical 363
Bicycle repairing, press for..... 372
Bicycle rim and tire..... 84
Bicycle saddle, wire..... 86
Bicycle, Victor 155
Birds of the Congo..... 169
Boat, the Layman 313
Boat, torpedo, the Maine's 376
Boots and shoes, improved..... 150
Boats, ice 136
Boats propelled by gasolene..... 305
Boats, torpedo, for the Maine.... 1
Boiler, improved..... 340
Boiler, water tube..... 244
Bolt cutter, new 165
Book copying 249
Bottle, wash, chemist's 5
Boulevard, Lafayette, New York. 58
Bracket, crank, cycle..... 106
Brake, bicycle, Wallace's..... 59
Brake, car, improved 261
Brake, vehicle 69
Brick cutting machine..... 104
Bridge, draw, Chicago..... 296
Bridge, East River..... 113
Bridge, hose 69
Bridge, North Sea Canal 392
Bridge, Pont-y-Pridd. 84
Bridge, suspension, proposed..... 169
Buffaloes, sporting..... 329

C

Cable, Atlantic, projectors..... 408
Cables, transportation of..... 344
Cactus dahlia 75
Calendar and time system..... 260
Calocalanus pavo..... 347
Camera shutter, simple..... 198
Canal drainage, Chicago..... 369
Canal, Harlem, opening..... 409
Canal, North Sea..... 392
Cannon magnets 73
Cannon, toy, Shimer's..... 310
Car, automobile, Serpollet..... 315
Car brake, improved 261
Car coupling, Dunlap's..... 212
Car coupling, Morton's..... 164
Car coupling, Sissom's..... 212
Car fender and brake 261
Car fender, Fees'..... 104
Car fender, revolving..... 116
Car fender, Trinchard's 326
Car truck, Esterley's..... 388
Card skimmer..... 395
Carriages, automobile..... 389
Carriage, electric..... 177, 213
Carriage, steam, Scotte..... 277
Cartridge tool 228
Ceilings, metal 72
Centering device..... 356
Chair, folding 164
Charcoal, pulverized..... 232
Check punch, new..... 262
Chimney flue cover 308
Chimney struck by lightning..... 132
Chuck, lathe, new..... 244
Churn, improved 180
City, Roman, Algeria 117
Clepsydra, mysterious..... 123
Clocks, Japanese..... 373
Clockwork, curiosities of..... 4
Cloud photography..... 137
College, teachers' 129
Color test, mechanical 121
Copilia vitrea..... 347
Comet, Edward Swift's..... 52
Conduit, railway, electric..... 59
Corn harvester..... 104, 164
Coupling, car..... 164
Coupling, car, Dunlap's..... 212
Coupling, car, Sissom's..... 212
Crustacea, flying..... 347
Cultivator, sugar cane 36
Cutlery sharpener..... 395
Cycle exhibition, New York 81
Cyclometer, "Trenton"..... 405
Cyclometer, U. S 106

D

Dahlia, cactus..... 75
Dana, James D 267
Defender, yacht..... 321
Dental engine, electric 372
Dental tool, Philbrook's..... 133
Deseret museum 241
Drainage canal, Chicago..... 369
Drawbridge, Chicago..... 296
Drawer, money, Daley's..... 340
Drill press for bicycles..... 372
Drilling machine, radial 325

E

Earpiece, telephone..... 244
Earthenware industry..... 193
East River bridge..... 113
Eclipse of moon, photograph..... 57
Electro-artograph 209
Electrolysis or street pipes..... 331
Electroplating hulls..... 56
Engine, 900 horse power..... 5
Engine, dental, electric..... 372
Engine, gasoline..... 375
Engine, gasolene, and boat..... 305
Engines, gas, electric light..... 341
Engine, traction, gasolene..... 294
Exhibition, cycle, New York, 66, 67, *81
Explosion, remarkable..... 248
Exposition, Atlanta..... 165
Exposition, French (1900)..... 197

F

Fan motor, water..... 342
Faucet, Byrne's..... 324
Feedwater regulator..... 149
Fender and brake, car..... 261
Fender, car, Fees'..... 104
Fender, car, revolving..... 116
Fender, car, Trinchard's..... 326
Furnaces..... 139
Fiber machine, Green's 356
Finger exercising device..... 181, 324
Fire eaters 219
Flue expander, Patten's..... 117
Frost cracks, fossil..... 102
Furnaces, gas, American..... 24

G

Gage, boiler alarm..... 133
Garbage carbonizer..... 338
Gas engine tricycle 25
Gas engines, electric light..... 341
Gas furnaces, American..... 24
Gasoline engine and boat..... 311
Gasoline motor..... 375
Gasolene traction engine..... 294
Gas well, Ohio..... 216
Glass, plate, industry 145
Glass, window, stained..... 345
Gnu, white tailed..... 299
Grain bin, new..... 70
Gun, Gatling..... 9

H

Hame tug, new..... 388
Harvester, corn..... 104, 164
Hat, crush, straw..... 379
Heater, water, Clarke's..... 116
Heating drum, Johnson's..... 324
Herald establishment, 273, 280, 281, 282
Hops, parasite of..... 134
Hood for carriages 182
Horse, evolution of 233
Horse power, Wood's..... 308
Horse shoe iron industry..... 41
Horse shoe, Richardson's..... 212
Hose bridge 69
Hotel Majestic..... 293
House, an attractive 213
House, Royal E..... 229
Hulls, electroplating 56

I

Ice boats..... 136
Ice formations on ships 184
Ice plane..... 229
Imaginations, measurement of... 85
Indiana, battle ship..... 8
Indicator, Alpine..... 219
Indicator, level..... 148
Injector, automatic..... 171
Ink well, Black's..... 228
Iron, bar, industry 41
Iron, curling, Brand's..... 404

J

Jungfrau railway..... 276

K

Knitting machinery, new..... 261
Koodoo antelope..... 377

L

Lamp, safety, miner's..... 308
Lamps, incandesc., manufact..... 225
Launches, naphtha..... 161
Laundry tubs, slate..... 152
Lead pipe manufacture..... 217
Leather staking machine..... 340
Letter copying book 245
Leveling device..... 148
Life line apparatus..... 325
Light, vault, Clapp's..... 52
Lightning, photograph of..... 379
Limbs, artificial 52
Log leader, Brough's..... 21
Lubricator, Mitchell's..... 116

M

Machine Co., National..... 337
Magnesium torch 218
Magnets, cannon 73
Maine, cruiser, boats for..... 1
Map, improved 251
Measuring device, lumber..... 90
Metal casting apparatus..... 196
Meter, electrical, Parker's..... 235
Meter, ampere, Bristol's..... 190
Micrograph, the 52
Mill, ore crushing 36
Money drawer, Daley's..... 340
Monument, Lick 153
Moon, eclipse, photograph..... 57
Mortising machine 187
Motor, dental, electric..... 372
Motor, fan, water..... 342
Motor, French's..... 180
Motor, gasoline..... 375
Motor, water, Rathbun's..... 293
Museum, Deseret..... 241

N

Naphtha launches..... 161
Nebula of Orion..... 74
Nitroglycerine, explosion of..... 361
North Sea Canal..... 392
North Sea Canal bridge..... 393

O

Oar lock, improved 182
Observatory, Yerkes 88
Odometer, Bell..... 405
Ore concentrator..... 36
Ore crusher 20
Oregon, battle ship..... 33, 353
Orion, nebula of 74
Oxen, sporting..... 329

P

Pagoda in banyan tree..... 89
Pampas, life in the 27
Parasite of hogs 134
Park, Yellowstone 408
Patent, decision relating to a..... 346
Photograph of an eclipse..... 57
Photography, cloud..... 137
Piano attachment..... 324
Pipe, lead, manufacture..... 217
Pipes, street, electrolysis 331
Plane, ice..... 229
Plant, water supply, DeKalb..... 401
Pliers, watchmaker's..... 260
Pontillina plumata..... 347
Pont-y-Pridd bridge 84
Porcelain, manufacture..... 193
Powder holder, Upton's 308
Power, horse, Wood's..... 308
Press, printing, Maurer's 148
Propeller, Puig's..... 356
Prunes, California..... 228
Pump, Breslau, great 68
Pump, force, George's 20
Pump gear, windmill 36
Pump, power, Stone's 312
Pumping power, Wood's..... 308
Punch and shears, combined..... 55
Punch, check, new..... 262
Punch, plate 25
Purdue University 289, 292

R

Rail joints, welding 100
Railroad crossing, Elizabeth, N.J. 65
Railway conduit, electric 59
Railway, elevated, Chicago..... 264
Railway station, Capistrano..... 149
Railway up the Jungfrau 276
Railways, suspended 328
Regulator, feedwater..... 149
Respirator, Loeb 203
Rhinoceros, Sumatra..... 245
Rifle, repeating, Blake..... 406

S

Saddle, wire, bicycle..... 86
Sandblast apparatus..... 277
Sash fastener..... 148
Scissors sharpener 20
Sextant, large angle 69
Sharpener, cutlery 395
Shears sharpener..... 20
Ship of war Indiana..... 8
Ship of war Oregon..... 353
Ship of war Terrible..... 392
Ships, electroplating..... 56
Ships, hulls of, electroplating..... 56
Ships of U. S. navy..... 199
Ships, war, Chinese 57
Ships, war, Texas and Oregon..... 32
Shutter, camera, simple..... 198
Sifter, ash, Briner's..... 404
Signaling device, electric..... 181
Skimmer, the card 395
Spectrum, artificial 308
Square and bevel 196
Statue of Minerva, Herald..... 273
Steamer St. Louis 360
Steamer St. Louis, saloon of..... 376
Steamer St. Paul..... 243
Street car fender 104
Stump puller, Wilson's..... 331
St. Louis, grand saloon of..... 376
St. Paul, steamer..... 249
Sugar cane cultivator..... 36
Sun spots..... 378
Sweeper, railway, Waite's..... 404
Synchronizer, electric..... 276

T

Teachers' college..... 129
Telegraph, typewriter..... 37
Telephone earpiece..... 244
Telephone system, Paris..... 53
Telephone transmitter, Blake..... 97
Terrible, ship of war..... 392
Tesla's experiments..... 185
Texas, war ship..... 32
Thimble cover, safety flue..... 308
Tiger hunting by night..... 385
Time dater, automatic 260
Timepiece synchronizer..... 276
Tire and rim, bicycle..... 84
Tire, elastic, Honrath's..... 324
Tool, reloading, cartridge..... 228
Torch, magnesium..... 218
Torpedo boats for the Maine..... 1
Torpedo boat, the Maine's..... 376
Torpedo placer, Seamand's 295
Trap, steam, Bundy..... 405
Tricycle, advertising..... 120
Tricycle, gas engine..... 25
Tricycle, petroleum..... 360
Tricycle, steam 177
Truck, car, Esterley's..... 388
Truck, logging 21
Tube, speaking, electric..... 388
Typewriter, Dougherty..... 357

V

Valve, balanced..... 164
Valve gear, electric..... 133
Vander Weyde, P. H..... 197
War ship Terrible..... 392
Vault, light, Clopp's..... 52
Veneer press..... 196
Victoria regia, the..... 361
Vinegar, white 181
Violin, Woolenhaupt..... 88

W

Wagon tongue support..... 212
War between Japan and China.. 105
War ships, Chinese, repairing.. 57
War ships, Texas and Oregon.... 32
Wash bottle, chemist's..... 5
Watch, bicycle and holder..... 308
Watches, curious 37
Water motor, Rathbun's..... 293
Water motor, Weed 155
Welding rail joints..... 100
Windmill pump gear 36
Window glass, stained..... 345
Woodpecker, boring..... 122
Wrench, convenient..... 103
Wrench, Delhommer's... 342

Y

Yacht Defender..... 321

MISCELLANY.

Figures preceded by a *star* (*) refer to illustrated articles.

A

Academy, French 92
Academy of Sci., Natl..... 291
Academy of Sciences, New York *233
Acetylene..... 118, 178
Acetylene apparatus..... *203
Acetylene as an illuminant..... 83
Acid, phosphoric, liquid..... 42
Acid, prussic, antidote for..... 82
Adjuster, brake, slack..... *405
Africa, notes on 227
Agricultural machines wanted.. 164
Air, compressed, water raising. 307
Air, electrification of..... 370
Air, liquefied, dangers of..... 264
Air pressures, working..... 307
Alabaster mines 274
Alaska, gold regions of..... 299
Aliens may become engineers.... 325
Alkaloids of cacti..... 106
Alloy, coin 26
Alloys, aluminum..... 230
Alloys, rare 267
Alpaca..... *265
Alps, lectures on..... 23
Alternator, a large..... 85
Altitude, high, work in..... 59
Aluminum alloys and solder..... 230
Aluminum horse shoes 353
Aluminum, notes on..... 188, 295
Aluminum, uses of..... 99
Amalgamator, ore..... *36
Ampere meter, Bristol's..... *180
Amylotryose..... 263
Anaconda mines..... 23
Anesthesia in animals..... 266
Anesthetic, the first..... 2
Animals, activity of 116
Animals, interesting *265
Animals, marine, minute..... 186
Ankles, sprained, treatment..... 87
Ant eater or echidna..... *265
Ants, agricultural..... 327
Ants, black, shower of..... 385
Antelope, the Koodoo..... *377
Anthion for washing prints..... 323
Anthrax in human beings..... 353
Antimony in Bolivia..... 394
Antitoxin, diphtheria..... 51
Antitoxin, progress of..... 85
Apoplexy..... 172
Apple, essence of..... 70
Apples, marketing..... 251
Arch, memorial, Brooklyn..... *11
Arch, triumphal, Roman..... *117
Argon, new element ..6, 132, 140, 251
Armor plate, boring holes in.. 232
Armor plate, test of 299
Armor plates, American 8
Armor plates, new procesz..... 155
Armor test..... 182
Armor test, remarkable 135
Army, needed increase of..... 40
Arrastra, the poor man's mill.... 243
Art products, American 344
Arts and industries, recent..... 163
Arsenic, the word, origin..... 391
Asbestos garments..... 202
Asbestos, uses of..... 212
Asia and North America..... 359
Association, American..... 355
Astigmatism, what it is..... 214
Astronomy, programme, 1895.... 172
Astronomy, world's debt to..... 9
Athletics, Japanese 18
Atlanta expos tion..... *165
Atmosphere, new element in.... 132
Auto-phoro-optometer..... *171
Aztec ruins, Arizona 247

B

Bacteriology, progress of..... 55
Baldness..... 377
Balloon army service..... 71
Balloon voyage, remarkable.... 148
Balloons, captive, use of..... 153
Balloons, experiences with..... 70
Balloons, life saving 85
Balloons, meteorological..... 405
Banyan tree, pagoda in..... *89
Barometer and thermometer, the 391
Barometer, history of..... 181
Barrels, oil, old..... 282
Base line apparatus..... 179
Bass, habits of..... 138
Baths, cold, danger of..... 374
Baths, Sutro..... 89
Battery, Capo-farad..... *43
Battery, mortar, Sandy Hook... 248
Battery, storage, traction..... 167
Battery, thermo, new 346
Battery zinc, amalgamation.... 188
Batteries, storage, charging..... *87
Battle ship Indiana..... *8
Batle ship Oregon..... *353
Battle of Yalu River,..... 21
Bee, hive, wax organs of..... 91
Bees, work of..... 138
Beet leaves for cattle..... 120
Beet sugar possibilities..... 354
Berths, pneumatic..... *43
Bessemer, treatment of..... 314
Bicycle, ambulance..... 362
Bicycle brake, pneumatic..... *59
Bicycle climbing, h. p. used 310
Bicycle exhibition, New York... *81
Bicycle, force exerted on..... 265
Bicycle frame. *106
Bicycle holder..... *73
Bicycle improvements..... *373
Bicycle, invention of..... 123
Bicycle, Keating..... *106
Bicycle lamp..... 388
Bicycle, Mall, new 279
Bicycle repairing, press for..... *372
Bicycle, the 409
Bicycle, the modern..... 315
Bicycle tires, paper..... 372
Bicycle, nautical..... *363
Bicycle, new use for..... 325
Bicycle, present status of..... 354
Bicycle, progress of..... 51
Bicycle riding 105, 137
Bicycle rim and tire..... *84
Bicycle saddle, wire..... *86
Bicycle, safety, French view..... 22
Bicycle show, New York..... 66, 67
Bicycle, Victor..... *155
Bicycle, war..... 187
Bicycles in militia drill..... 182
Bicycling, healthfulness of..... 5
Bicycling and the heart 295
Bicyclist, female, French 372
Bilge keels..... 328
Bindings, old, restoration 391
Birds and the farmer..... 370
Birds, bower, of New Guinea.... 340
Birds of the Congo *169
Birds, flight of..... 234
Birds, misfortunes of 341
Birds and their persecutors..... 39
Birds, tongues of..... 86
Bismuth in Bolivia..... 394
Blackberries, profit from..... 116
Blacksmithing, amateur..... 146
Bleaching cotton 359
Bleaching, electricity in..... 362
Bleaching, electrolytic process.. 323
Bleaching straw braid..... 183
Blow hole, Kiama, N. S. W..... 297
Blowpipe glass mixture..... 365
Boat, canal, ironclad..... 196
Boat, the Layman *313
Boat, life, jet propelled..... 98
Boat-lowering devices needed.. 331
Boat, torpedo, aluminum. 283
Boat, torpedo, Boxer 108
Boat, torpedo, for the Maine..... *376
Boats, ice *136
Boats, pilot, steam 259
Boats propelled by gasoline..... *311
Boats, torpedo, for the Maine... *1
Boats, torpedo, U. S., new..... 260
Boats, torpedo, in war..... 184
Boiler explosions..... 35, 135
Boiler, improved *340
Boiler, water tube. Hedge's..... *244
Boilers, injury to by grease..... 87
Boils, to arrest..... 134
Bolt cutter, new *165
Book, copying, Bushnell's..... *245
Books of the Aztecs 166
Bookmaking, evolution of..... 151
Boots and shoes, lining for..... *150
Bone black, suppression of..... 228
Bordeaux mixture..... 341, 358
Bottle, wash, chemist's..... *5
Boulevard Lafayette, New York *58
Boundaries, parallel..... 18
Box, as specimen shrub..... 353
Boxer, torpedo boat 108
Brains, a collection of..... 122
Brains versus luck..... 251
Brake, bicycle, Wallace's..... *59
Brake, car, improved..... *261
Brake, vehicle, Coal's..... *69
Brick-cutting machine..... *104
Brick, waterproofing..... 258
Bricks, glass..... 361
Bridge, ancient, modernizing.... 148
Bridge of concrete 57
Bridge, draw, Chicago..... *296
Bridge, East River *113
Bridge, hose..... *69
Bridge, natural, of Oregon..... 151
Bridge, North Sea Canal..... *392
Bridge, Pont-y-Pridd..... *84
Bridge, suspension, proposed.... *169
Buffaloes, breeding of..... 196
Buffaloes, sporting..... *329
Building materials, wood fiber.. 70
Buildings, fireproof..... 9
Burner, gas, De Mare..... 330
Burner, gas, prize for..... 9
Burner, gas, incandescent..... 380
Burns, from cold..... 155
Business maxims, good 211
Buoy, ship's, combined..... 114

C

Cable, Atlantic, projectors..... *408
Cables, transportation of..... *344
Cables, wire, preservation..... 132
Cableway, aerial, Brighton..... 219
Cactus dahlia..... *75
Cacti, alkaloids of..... 106
Calcium carbide, aspects of..... 184
Calendar and time system..... *260
California products in Berlin ... 298
Camera shutter, simple *198
Canal, Block Island..... 402
Canal boat, ironclad 196
Canal, Cape Cod 394
Canal celebration, Germany..... 402
Canal, drainage, Chicago... *369, 387
Canal improvements, important. 3
Canal, Harlem, opening..... *409
Canal, North Sea..... *392, *394
Canal, San Blas..... 263
Canal, ship, great..... 251
Canal, ship, to lakes..... 42
Canal towage, electric..... 380
Canals, N. Y., electricity on..... 131
Canals, ship, projected..... 90
Candle, electric..... 345
Candles and soap, coloring..... 73
Cannery, floating..... 245
Cannon magnets..... *73
Cannon, toy, Shimer's..... *310
Cape Cod Canal..... 394
Car, automobile, Serpollet..... *315
Car brake, improved..... *261
Car coupling, Dunlap's..... *212
Car coupling, Morton's..... *164
Car coupling, Sissom's..... *212
Car fares, street, cheap..... 59
Car fender..... *326
Car fender and brake..... *261
Car fender craze 215
Car fender, Fees'..... *104
Car fender, revolving..... *116
Car fenders. 258, 275
Car lines, trolley, accidents..... 146
Car speed device needed..... 135
Car, street, parcel service 101
Car, street, transfers..... 101
Car truck, Esterley's..... *388
Cars, Brooklyn Bridge, light..... 278
Cars, electric, as life savers..... 314
Cars, freight, doors 294
Cars, freight, 3,000 new..... 266
Cars, new, output of 360
Cars, oiling, waste for..... 119
Cars, trolley, palace..... 67
Carbon dioxide, crystallized..... 259
Carbon and hydrogen, synthesis 114
Carbuncles, to arrest..... 134
Card skimmer..... *395
Career, choice of a..... 34, 66
Carriage bodies, painting 199
Carriage, electric..... *177, *213
Carriage, steam, Scotte *277
Carriages, automobile, history... *389
Carriages, horseless, race of..... 387
Cartridge reloading tool *228
Casting patterns, rubber..... 134
Caterpillars, tons of..... 58
Cattle feeding..... 120
Cattle steamer, Cunard..... 279
Cayley, Prof..... 91
Ceilings, metal *72
Cellulose paint..... 250
Cement mortar..... 107
Cement for porcelain..... 70
Cements and limes..... 374
Cements, concretes and mortars. 10
Centenarians, two..... 73
Centering device, Kolb's..... *356
Chair, folding..... *164
Character and physical cond..... 307
Characters, acquired 138
Charcoal and products..... 163
Charcoal, pulverized *232
Check punch, new..... *262
Cheese, Camembert 172
Chemist, career of a..... 130, 211
Chicago drainage canal..... *369, 387
Chimney flue cover..... *308
Chimney, slag brick..... 355
Chimney struck by lightning..... *132
Chlorophyl 234
Chuck, lathe, new..... *244
Churn, improved..... *180
City cleanliness, advantages..... 86
City, Roman, Algeria..... *117
Claim, how to locate a..... 308
Clay eating 186
Clepsydra, mysterious *123
Clocks, Japanese..... *373
Clockwork, curiosities of..... *4
Close call, a... 11
Clothing, cleaning 166
Clothes, how to clean..... 104
Cloud photography..... *137
Coal, cheap..... 242
Coal consumpt,, torpedo boat.. 314
Coal dust, explosion of..... 103
Coal mines, depths of..... 378
Coal production of the world.... 395
Coal tar dye industry..... 266
Coast of U. S., guarding the..... 163
Cocaine habit..... 283
Coin alloy..... 26
Cold, effects on mind..... 103
Cold, extreme, 424° below zero.... 60
Colds, cure for..... 379
Colds, treatment of 310
College, a teachers'..... 135
Collodio-chloride emulsion..... 298
Colocynth apples..... 268
Color test, mechanical, *121, 150, 182, 231
Colors in colored light, percep.... 311
Combustion, curious case of..... 84
Comet, Edward Swift's..... *52
Comets due in 1895 58
Commerce, interstate, report..... 57
Commutators, repairing..... 326
Concrete for bridges 57
Concretes, cements and mortars. 10
Conduit, railway, electric *59
Cooling devices for dwellings... 102
Copeland, Charles W 98
Copyright abuses, international. 6
Copyright decision, British..... 279
Corn harvester..... *104, *164
Corn stalks and cocoanut husks.. 402
Cotton, bleaching 359
Cotton crop, American..... 407
Cotton, silky appearance..... 156
Cotton transportation 133
Coupling, car..... *164
Coupling, car, Dunlap's..... *212
Coupling, car, Sissom's..... *212
Court, Circuit decision.. 183
Courting of animals..... 327
Cramp, Charles H..... 307
Crops, our cereal, value of..... 74
Crossings, railway grade..... 36
Crustacea, flying *347
Cultivator, sugar cane *36
Currents, electric, strong..... 119
Cutlery sharpener..... *395
Cyanide poisoning, antidote..... 82
Cycle exhibition, New York... *81
Cycle show, national..... 66, 67
Cycling and the heart..... 295
Cyclometer, "Trenton"..... *405
Cyclometer, U. S..... *106

D

Dahlia, cactus..... *75
Dairy school, Wisconsin 250
Dana, James D..... *267
Decay, physical..... 102
Defender, yacht..... *327
Dennison, A. L., the late. 51
Dental engine, electric..... *372
Dental tool, Philbrook's..... *133
Dentistry, electricity in..... 92
Derelicts, destroying..... 188
Derelicts, destruction of 218
Derelicts, wanderings of..... 69
Deseret Museum *241, 330
Detector, submarine..... 11
Deutzia, leaves of 228
Device, curling..... *404
Diamond, a large 219
Diamonds, how proved genuine.. 371

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Diarrhea and earth temperature. 360
Diastase, preparation of 43
Diatoms 132
Diphtheria antitoxin 51
Diphtheria cure, the new 120
Diphtheria cure, progress of 85
Diphtheria, remedy for 75
Disappearances, mysterious 216
Disaster, great, lessons of 82
Discoveries at Heraion 360
Diseases, incubation of 359
Dishonesty the nation's peril 166
Dock, winter, of Petrel 243
Dog, life saving 286
Darkey, a useful 267
Doors, freight car 294
Drainage canal, Chicago *369, 387
Drawbridge, Chicago *296
Drawer, money, Daley's *340
Drill press for bicycles *372
Drowning, what it feels like 85
Drilling machine, radial *325
Drops 167
Drug stock, deterioration 343
Dyes, coal tar 266

E

Ear piece, telephone *244
Earth, crust of, breaking 342
Earth and man, future of 99
Earthenware industry *193
Earthquake, recent, Europe 263
Earthquake waves 34
East River bridge *113
Eaton Daniel G 244
Echoes, curious 250
Eclipse of moon, photograph *57
Education, advanced system 274
Egyptological 363
Elbe, steamer, loss of 82, 185
Electric transmission of energy 194
Electrically shocked, aid to 179
Electricity and prestidigitation 394
Electricity, atmospheric 214
Electricity in bleaching 362
Electricity on canals 131
Electricity in dentistry 92
Electricity, discharge, curious 279
Electricity in Japanese war 291
Electricity, nature of 218
Electricity, plowing by 391
Electricity in sugar manufacture 20
Electricity, what is it? 122
Electrification of the air 370
Electro-artegraph *214
Electrolysis of street pipes *331
Electroplating ships' hulls *56
Element, the new 6
Emery millstones 131
Energy, electric transmisson 194
Energy and force 290
Engine, dental, electric *372
Engine, 900 horse power *5
Engine, gasoline, boat *375
Engine, gasoline, and boat *311
Engine, traction, gasoline *294
Engine, wreck of an 18
Engines, gas, for electric light *341
Engines, gasoline 136
Engines, powder 103
Engineer, how to make 92
Engineers, aliens as 325
Engineers, electrical, demand 204
Engineers, mechanical, society 387
Engravings how to copy 313
Enterprise, deserving 23
Eozoon 234
Epileptics, Craig colony for 178
Eucalyptus growth of 246
Eucalyptus, importance of 131
Evidence, law of 252
Excavations in Greece 379
Exercise, systematic 228
Exhibition, cycle, New York, 66, 67 *81
Exhibition, microscopical 60
Exhibition, Paris, of 1900 359
Exhibition, Sculpture Society 219
Expedition, antarctic 302
Expedition, Greenland 347
Explosions 135
Explosions, boiler 135
Explosion, remarkable *248
Exposition, Atlanta *165
Exposition, Chicago, awards 171
Exposition, French, of 1900 *197
Exposition in Mexico 214
Eye mistakes 119

F

Factory inspector, report 179
Fairs, World's, in 1896 295
Falls of Niagara 69
Fan motor, water *342
Farms, experimental, Canada 179
Faucet, Byrne's *324
Feedwater regulator *149
Fencing with newspapers 372
Fender and brake, car *261
Fender, car *326
Fender, car, Fees' *104
Fender, car, revolving *116
Fender craze 215
Fenders, car 258, 275
Fenders, street car 85, 406
Fennecs *139
Ferns, chemical 250
Fever, typhoid, from oysters 7
Fiber machine, Green's *356
Filaments, incandescent 347
Filter, asbestos 92
Filter beds 198
Filter, salt water 394
Finger exercising device *181, *324
Firearms, American in Germany 50
Firearms, new, handling 268
Fire damp, detection 177
Fire eaters *219
Fire engines, primitive 198
Fires from incandes. lamps 326
Fires, thick 71
Fireman, locomotive 40
Fish, amphibious 138
Fish and game laws 375
Fish, food, Alaskan 179
Fish, food, destruction of 23
Fish farms, profitable 23
Fish hatchery, Cold Spring 60
Fishes, aquarium, food of 58
Flowers, frost, photographing 85
Flowers, preserving color of 194
Flue expander, Patton's *117
Flier, the steamer 151
Flywheel accidents 27
Fog signals 298
Food, human, of future 122
Foods, nutritive 186
Force and energy 290
Forest, a great 139
Forests of national domain 19
Formaldehyde in photogelatin 246
Frame, piano action *404
Frost cracks, fossil *102
Frost flowers, photographing 85
Fruit preservation 250
Fuel, liquid 99
Furnaces, blast, of U. S. 75
Furnaces, gas, American *24

G

Gage, boiler alarm *133
Game and fish laws 375
Garbage carbonizer *358
Garden, Botanical, N. Y 405
Garments, asbestos 202
Gas, acetylene 118
Gas, blast furnace 391
Gas burner, incandescent 380
Gas burner, the De Mare 330
Gas burner, prize for 8
Gas engine tricycle *25
Gas engines for electric light *341
Gas furnaces, American *24
Gas meter, nickel-in-slot 85
Gas, natural, high pressure 7
Gas, natural, lines 316
Gas well, Ohio *216
Gases, liquefaction of 220
Gasoline engine and boat *311
Gasoline engines 136
Gasoline motor for boats *375
Gasoline traction engine *294
Gelatin, bichromated 89
Gemini, star figure in 355
Giraffe, ten feet high 180
Giralda steam yacht 7
Glass bricks 361
Glass, decomposition of 106
Glass, electrolysis of 70
Glass, field, new 92
Glass, hardening 70
Glass mixture, blowpipe 385
Glass, ornamenting 55
Glass, plate, American 167
Glass, plate, industry *151
Glass, porous, for windows 28
Glass, solder for 70
Glass, some facts about 387
Glass, silvering 407
Glass, stained, ancient and mod. 326
Glass, window, stained *345
Glue, liquid 238
Gnu, white-tailed *299
Gold, extracting, new process 311
Gold extraction 188
Gold fillings 3
Gold mines, discoveries of 203
Gold nuggets, great 259
Gold production of Africa 166
Gold regions, Alaskan 299
Gold, substitute for 188
Gold, toning bath, recovery 275
Governor, magnetized 204
Grain bin, Kurtz's *70
Grape fruit as a tonic 325
Graphite from iron 250
Grass, sleepy 327
Grasses, dyed 55
Gravity system, Holly 213
Greece, excavations in 379
Greenland expedition, 1895 347
Gridley, James H 18
Grief from a medical standpoint. 283
Grinders for metal rolls 252
Gulf stream, cause of 195
Gun, Gatling *9
Gun, 15 inch, bursting 345
Guns, machine, new use for 146
Guns, machine, wanted 358
Guns made of paper 372
Guns, rapid fire 134
Gunpowder, smokeless 262
Gypsy, moth, war on 3

H

Hair of Russian student 314
Hame tug, Hoberecht's *388
Hammerkop, dancing 327
Harbor, New York, improvements 87
Harp, antiquity of the 395
Harvester, corn *104, *164
Hat, crush, straw *379
Hatchery, Cold Spring Harbor 60
Hawk, Cooper's 43
Heater, water, Clarke's *116
Heating drum, Johnson's *324
Heavens in February 82
Heavens in March 130
Heavens in April 210
Heavens in May 290
Heavens in June 338
Helium 227
Helmholtz, in honor of 28
Hematite mining, Greece 364
Herald, New York, estab *280
Hint, a valuable 307
Hogs, parasite of *134
Hood for carriages *182
Horn, welding 92
Horse, evolution of *233
Horse power, Wood's *308
Horse shoes, aluminum 353
Horses, color of 59
Horseshoe iron industry *41
Horseshoe, Richardson's *212
Hose bridge *69
Hotel Majestic *293
Hotels in East India 167
House, an attractive *213
House, masonry, moving 298
House, a Pompeian 11
House, Royal E *229, 147
House, tubular frame 149
Hurricane, Tillamook Light 86
Hydrogen and carbon, synthesis 114
Hydrogen, liquefaction of 265
Hydrogen, peroxide 26, 181
Hydrogen, sulph., substitute 147
Hydrophone, the 187

I

Ice boats *136
Ice cake, revolving 85
Ice formations on ships *184
Ice plane *229
Ignorance not a defense 403
Illumination, artificial 55
Illustrations, paper, how made 35
Imaginations, measurement of *85
Immigration, cost of 278
Incomes, Eng. and American 26
India rubber 99
Indiana, battle ship *8
Indicator, Alpine *219
Indicator, level *148
Induction experiment, Ampere's 363
Influenza 226
Influenza epidemic in Europe 242
Inhumanity, French 409
Injector, automatic *171
Ink well, Black's *228
Insect organs, food influence 138
Insect stings, remedy for 118
Insects and flowers 410
Insects, economic uses of 234
Insects in Florida, clearing out 245
Insects, hothouse, to destroy 147
Insects, sight in 234
Insects, snow 120
Insects, sounds of *91
Institute, Pratt 122
Insulator, new *375
Invention needed 135
Inventions in building 5
Inventions, new, prizes for 147
Inventions, recently patented 12, 29, 44, 60, 76, 93, 108, 121, 140, 156, 172, 188, 204, 220, 236, 252, 268, 284, 300, 316, 332, 348, 364, 380, 396, 411
Inventors, a chance for 138
Inventors, our debt to 316
Iron, bar, industry *41
Iron, notes on 356
Iron, protect. from rust 391
Iron, punching of 135
Iron, salted 104
Iron working, primitive 386
Iron and steel, protection 345
Iron trade situation 358
Iron at welding temperature 227
Irone 374
Irrigation, progress of 38
Irrigation by wind 311, 342

J

Japan, troops of 7
Jars, battery, paper 117
Jaws, human, force of 386
Jeddo tunnel 149
Jerusalem, discovery in 88
Joints, stiff, new cure for 180
Joints, wonders of 295
Juggler, the penny 19
Jungfrau railway *276

K

Keels, bilge 328
Keller, Helen 7
Kidney, railroad 377
Knitting machinery, improved *261
Kola nuts 250
Koodoo antelope *377

L

Lake, Italian, new 326
Lake, Medical 74
Lake Superior, gateway to 294
Lakes, sodium, Wyoming 92
Lakes, temperatures of 402
Lamp, bicycle 388
Lamp, safety, miner's *308
Lamps, incandescent, man'f. *230
Lantern entertainment, novel 276
Lantern slides 313
Laryngoscopy, direct 347
Launches, naphtha *167
Laundry tub industry *152
Law, eight-hour, Illinois 244
Law of evidence 252
Law and photography 262
Law, railroad telegraphers' 259
Laws, game and fish 75
Lead pipe manufacture *217
Lead poisoning in dyeing 36
Leather staking machine *340
Leaves, fall of 91
Leaves, respiration of 91
Lemon, oil of 202
Lens, great, testing 409
Lenz, missing cyclist 263
Lenz, wheelman, search for 74
Letter officially defined 184
Leveling device, Darragh's *148
Library, Columbia College 331
Lick monument *153
Lifeboat, jet-propelled 98
Life line apparatus *325
Life, long, secret *27
Light, arc, Brush 162
Light arc, dangers 66
Light, electric, mains 245
Light, electric, on war ships 371
Light of the future 6
Light, reflection of 182
Light, vault, Clopp's *52
Lights and colors 235
Lighthouse apparatus 385
Lighthouse, novel 392
Lighthouses, United States 121
Lighting and heating, electric 322
Lighting, incandescent 364
Lightning freaks 295
Lightning, photograph of *379
Lightning, photographs of 330
Limbs, artificial *52
Limes and cements 374
Lion from medical view point 123
Liquors, ageing 188
Literature, life of our 73
Living, fast 74
Loading ocean steamer 410
Lobster laws 2
Locomotive cabs, English 329
Locomotive fireman 40
Locomotives, tools on 312
Log loader, Braugh's *21
Logging device, novel 123
Loomis, Dr. A. L 131
Lubrication, uneconomical 403
Lubricator, Mitchell's *116
Ludwig, Prof. Karl 307
Lumber flume, ride down 390
Lyceums, military 283

M

Machine Co., National *337
Madagascar expedition 51
Magazine illustrations 35
Magnesium torch *218
Magnetism of watches 390
Magnets, cannon *73
Mahogany, African 262
Mail bicycle, new 279
Maine, cruiser, boats for *1
Mains, electric light, dangers 245
Malaria 116
Man and earth, future of 99
Man, vestigial structures in 375
Manufactories, American 149
Map, Arriaga's *251
Maple sap, flow of 388
Mars, latest news from 137
Mars, snows of 39
Mars, spectrum of 67
Match, lucifer, inventor 58
Matches, invention of 251
Measuring device for lumber *20
Meat exports, Argentine 244
Mecca, pilgrimage to 378
Mechanics, finest in the world 211
Meerschaum industry 308
Metal casting apparatus *196
Metal, molten, shipment 382
Metal, varnishing 106
Metals, rare 267
Meter, ampere, Bristol's *180
Meter, electrical, Parker's *235
Meter, gas, nickel-in-slot 85
Meteorite, Chupaderos 386
Meteorite, Iowa 134
Meteorite, Plymouth 35
Mexico, exposition in 214
Mica, new use for 184
Microbes, how to fight 310
Micrograph, the *52
Microscopical exhibition 60
Milk, boiling point of 298
Milk as a diet 391
Military science at Yale 50
Mill, ore crushing *36
Milling work, speed in 387
Millstones, rock emery 131
Mines, Anaconda 23
Mines, coal, depths of 378
Mines, gold, discoveries of 203
Mirage, a remarkable 6
Mirrors, silvering, method 146
Missing link found 51
Mithridates, a head of 147
Molasses bleaching by zinc 60
Money, drawer, Daley's *340
Money, legal tender 139
Money, purchasing power 196
Monkey skins 250
Monkey and the sugar 307
Monozite, value of 386
Monument, Lick *153
Moon, eclipse, photograph *57
Moon's story 338
Mortar, cement 107
Mortars, cements and concretes 10
Mortality of New York State 148
Mortising machine *187
Mosaics, St. Sophia 394
Moth, gypsy, war on 3
Motions, infinitely rapid 283
Motor, compressed air 170
Motor, dental, electric *372
Motor, fan, water *342
Motor, gasoline, for boats *375
Motor, French's *180
Motor, water, Rathbun's *293
Motor, water, Weed *155
Motors, gasoline 136
Mount Everest 315
Mountain ascents, high 187
Mouth hygiene 83
Mules, astonished 19
Museum, Deseret 330, *241
Mushrooms and manure heaps 274

N

Naphtha launches *167
National history notes 234, 91, 135, 327
Nature, learning from 153
Nature and science 156
Navies of the world 149
Nebula, photographic, great *74
Neptune, diameter of 376
Nerves, house 267
Nervous system 156
Newspaper, making a 324
Newton, Gen. John 307
New York harbor improvements 87
New York Herald, estab *280
Niagara aerial tramway 178
Niagara electric railway 179
Niagara Falls 69
Niagara, power at, cost 278
Nickeling, electro 103
Nitroglycerine, explosion of *361
North Sea canal *392, 394
North Sea canal bridge *392
Notes, electrical 407
Nut planting 19

O

Oarlock, improved *182
Obesity, recipe for 5
Observatory, Lick, gift to 246
Observatory, Yerkes *88
Ocean, temperature of 11
Odometer, Bell *405
Oil barrels, old, explosion of 282
Oil fields of Ohio 103
Oil, gas and water from artesian well 407
Oil of lemon 202
Oil production, Pennsylvania 202
Oil, skunk 155
Oleander, the 325
Olympia, steam tunnels of 226
Onyx, Mexican 52
Opaline laminae 282
Orange crop, injury to 39
Ordnance factories, army 10
Ordnance notes 179
Ore crusher *20
Ore concentrator *36
Ores, preparation 92
Oregon, battle ship *353 *33
Organ, American liner St. Louis 408
Orion, nebula of *74
Orizaba in eruption 182
Ostrich farm, work on 43
Oxen, sporting *329
Ozone, production of 92

P

Pagoda in banyan tree *89
Paint, cellulose 250
Paint for ships' hulls 188
Palais de l'Elysee 297
Palate, cleft, treatment of 51
Pampas, life in the *27
Paper, electrified 195
Paper guns and tires 372
Paper, indigo blue 218
Paper sails 356
Paper, wall, arsenical 388
Parasite of hogs *134
Parcel service, street car 101
Park planting 42
Park, Yellowstone National *408
Parrot, the sheep 138
Patent commissioner's report 130
Patent decision, important 162
Patent laws, construing 91
Patent Office fire, another 278
Patent Office, delayed cases in 2
Patent statute, unjust 215
Patent suits, limitations 50
Patent trusts 210
Patents, American 154
Patents, decisions relating to 3, 90, 154, *346, 403
Patents, design 212
Patents, exhibition of 212
Patents, sales of 379
Paving, improved 274
Peach tree diseases 250
Peach trees, protecting 26
Pearl, imitation of 115
Pedestrians, right of 391
Perfumes, artificial 70
Peters-Denza-Ranyard 26
Petrel, U. S. S., dock of 243
Petroleum 364
Petroleum fields, Ohio 103
Petroleum, great illuminant 258
Pheasants, Mongolian 150
Phelps, George M 291
Phonograph vs. graphophone 58
Phonograph in typography 136
Phonograph voice 265
Phosphate industry 167
Phosphorescence 391
Phosphorescence, cold 89
Physical decay 102
Photo-engraving method 275
Photo hints 355
Photo work, half tone 27
Photos, coloring 90
Photographs, copyright in *199
Photographs, up-to-date 377
Photography, cloud *137
Photography and law 262
Photography in natural colors 402
Photography, shop 330
Piano attachment *324
Pier, railway, large 187
Pigeon keeping 326
Pigeons, carrier, naval 262
Pigments, coal tar 275
Pilgrims, Mecca 378
Pilot boats, steam 259
Pineapple, essence of 70
Pipe, lead, manufacture *217
Pipes, steam, water in 230
Pipes, street, electrolysis *331
Plane, ice 229
Plants, co-operation in 327
Plants, effects of light on 104
Plants, ferment in 234
Plants, how to mount 277
Plants, vascular, origin 138
Platinum 231
Pliers, watchmaker's *260
Plow, faults of 410
Plowing by electricity 391
Pocket, dangers in the 136
Poisons, determination of 391
Policy, inconsistent 310
Pont-y-Pridd bridge *84
Porcelain, manufacture of *193
Positives, direct 154
Postage rates, foreign, new 55
Postage stamp, international 3
Postal rates, foreign 84
Postal service, trolley 28
Pottery tree, the 362
Pottery tree, Brazilian 91, 196
Powder engines 103
Powder holder, Upton's *308
Powder, smokeless 119, 262
Power at Niagara, cost 407
Power, electric transmission 56
Power, horse, Wood's *308
Power, water 395
Power at Niagara, cost 278
Press, printing, Maurer's *148
Prestidigitation and electricity 394
Prince, Crown, of Siam 166
Prints, bromide, permanence 67
Projectiles, Hadfield's 262
Propeller, Puig's *356
Propeller, screw 340
Propeller shafts 9
Prune rust 344
Prunes, California *228
Pulp, wood 235
Pump, Breslau, great *68
Pump, force, George's *20
Pump gear, windmill *36
Pump, power, Stone's *312
Pumping power, Wood's *308
Punch, check, new *262
Punch photograph 36
Punch, plate, hydraulic *25
Punch and shears, combined *55
Purdue University *292
Pyrites, striking fire from 74

Q

Quarrying by fire 147
Quebracho in tanning 147, 404
Quicksilver mines, Almaden 363
Quince culture 246

R

Race, bicycle, Chicago-New York 402
Refractometer, differential 403
Rail joints, welding *100
Railroad building in 1894 26
Railroad, Central, crossing *65
Railroad, elevated, Chicago 322
Railroad line, fast 118
Railroads, German 85
Railroading, problem in 19
Railway building, activity in 232
Railway, Canadian Pacific *259
Railway conduit, electric *59
Railway, electric, Niagara 179
Railway, electric, in U. S. 315
Railway, elevated, Chicago *264
Railway grade crossings 26
Railway of the Jungfrau *276
Railway pier, large 187
Railway, Siberian 108
Railway speeds, high 163, 344
Railway station, Capistrano *149
Railway ticket, novel 36
Railway trains, English 230
Railway, a wooden 203
Railways, American, income 177
Railways, American, criticism 394
Railways, cable and electric 163
Railways, street, electric 3
Railways, suspended, systems *328
Rat poison, novel 131
Rats, to drive away 358
Rawlinson, Sir Henry 163
Rayleigh, Lord 396
Refractory mixture 207
Regulator, feedwater *149
Reina Regente, loss of 235
Relics, Columbian, return 23
Respirator, Loeb *203
Rhinoceros, Sumatra *245
Rhododendrons 358
Rice for feed 315
Richmond, Calif 370
Rifle, repeating, Blake *406
Rifle, the Mauser 231
Rifle, navy, new 360
Rifle test, interesting 194
Robbers, train, to repel 133
Rome, streets of, clean 342
Rome, water supply of 84
Ropes, wire, preservation 132
Rubber, artificial 70, 391
Rubber casting patterns 134
Rubber substitute 154
Rubber tree tappers 115
Rubies, how tested 371
Rubies of Burma 235
Rust, preservative against 70
Rust, protection against 267
Rust, prune 344

S

Saddle, wire, bicycle *86
Safe making, scientific 275
Sails, paper 356
Salmon and trout 138
Salt electrolysis, products 71
Salt manufacture, Mexico 119
Salt, sea, electrolysis 92
Saltpeter, African 7
San Blas Canal 263
Sand blast apparatus *277
Sap, ascent of 91
Sapphires, how tested 371
Sash fastener, Rathbun's *148
Saturn, observations of 323
Saturn, rings of 277
Scale, California 120
School, dairy, Wisconsin 250
Science and nature 156
Science notes 6, 70, 92, 250, 188, 391
Scientist, American, honor for 120
Scissors sharpener *20
Screw, set, loose 87
Screw, triple 260
Sculpture, exhibition of 219
Seal industry 2
Sea, supremacy of the 370
Seamen, lodgings for 220
Seeds, vitality of 234, 391
Seely, Franklin A 154
Selenite, substitute for 170
Separator, milk, bursts 409
Sewer main, new, Paris 106
Sextant, large angle *69
Shad in California 150
Shafts, propeller 9
Sharpener, machine *395
Shears sharpener *20
Ship building wages 118
Ship canal, great 251
Ship canal to the lakes 42
Ship canals, projected 90
Ship of war Indiana *8
Ship of war Oregon *353
Ship, war, Reina Regente 235
Ship of war, Russian 133
Ship of war Terrible *392
Ships, derelict 218
Ships, derelict, destroying 188
Ships, derelict, wanderings 69
Ships of war, lighting 371
Ships, war, Chinese *57
Ships of war, modern 117
Ships of U. S. navy *199
Ships, war, Texas and Oregon *52
Shoe machinery, American 259
Shot, muzzle velocity of 102
Shovel, the steam 138
Shutter, camera, simple *198
Sickles, F. E 195
Sifter, ash *404
Signaling device, electric *181
Signals, fog 296
Silk, artificial 243, 278
Silk cleaning, soap for 379
Silk industry in Syria 165
Silk waste wipers 297
Silver, tin, etc., prices 139
Skimmer, the card *395
Skunk oil 155
Snakes, ravages of, in India 308
Snow as an air purifier 183
Snow insects 120
Soap bubbles, frozen 279
Soap bubbles, photographing 216
Soap and candles, coloring 73
Soap for cleaning silk 379
Soap, soft, potash 338
Soap and washing compounds 164
Sodium lakes, Wyoming 92
Sodium in the streets 195
Soils, bearing power of 23
Solder, aluminum 230
Solder for glass 70
Soldiers, effect of weight on 260
Sparrow, English 266
Specimens, botanical, to mount 277
Spectrum, artificial *308
Spectrum of Mars 67
Speed indicator 23
Spider, web of the 363
Spiders, man's debt to 186
Sponge industry Florida 38
Sponges, cultivating 261
Square and bevel *196
Stains for wood 184
Staircase, capitol building 35
Star figure in Gemini 355
Stars, nearer to the 28
Steam pipes, water in 230
Steamboat Fher 151
Steamboat, sectional 379
Steamer, cattle, Cunard 279
Steamer company, largest 117
Steamer Elbe, loss of 185
Steamer, ocean, disabled 113
Steamer St. Louis *360, 387
Steamer St. Louis, first voyage 386
Steamer St. Louis, saloon of *376
Steamer St. Paul *249
Steamers, French, new 106
Steamers, lake, new 294
Steamers, 400 foot 227
Steel, ferrous 252
Steel and iron, protection 345
Steel, microscopical analysis of 228
Steel, protect. from rust 391
Steel, punching 135
Steel at welding temperature 227
St. Louis, first voyage of 386
St. Louis, steamer *360, 387
St. Louis, steamer, saloon of *376
St. Paul, steamer *249
Straw braid, bleaching 183
Stream forms, solid 331
Street car fares, cheap 59
Street car fender *104
Street car fenders 85
Street car motor 170
Street car parcel service 101
Street car transfers 101
Streets, how to clean 391
Streets of Rome, clean 342
Students, Russian, treatment 314
Stumppuller, Wilson's *331
Suburb, a model 370
Sugar, best, possibilities 354
Sugar cane cultivator *36
Sugar manufacture, electricity in 20
Sugar, a new 263
Sugars, note on 277
Sugar process, new 8
Sulphur, is it simple? 250
Sunflower cake, meal of 322
Sun spots *378
Sun spots and aurora 246
Superphosphates, manufacture 42
Susquehanna River, utilizing 7
Sutro baths 89
Swallowing alive 7
Sweeper, rail way *404
Synchronizer, electric *276

T

Tanning, quebracho in 147
Tar, useful products from 163
Tea and coffee culture, Hawaii 54
Teeth, electric extraction 92
Teeth filling, gold 3
Telautograph in Europe 50
Telegraph, African 250
Telegraph, typewriter *37
Telegraphers, railroad, law 259
Telegraphy in Texas 87
Telegraphy without wires 378
Telephone, Berliner, decision 338
Telephone ear piece *244
Telephone, invention of 314
Telephone mouthpiece, new 152
Telephone system, Paris *53
Telephone transmitter, Blake *97
Telephone transmitter, new 339
Telephone, trolley 66
Telephone wires, protecting 87
Telephones, wire fence 150
Telephony, early history 247
Telescopes, divided lens 83
Temperature, high altitude 250
Terrible, ship of war *392
Tesla's loss *185
Texas and Oregon, warships *32
Thallium, new ore of 391
Thermometers, deep sea 377
Thimble cover, safety flue *308
Thistle, Russian 23, 55
Ticket, railway, novel 36
Tiger hunting by night *385
Tiles, substitute for 282
Timber boom 279
Time cater, automatic *260
Timepiece synchronizer *276
Tin, prices of 139
Tire, elastic, Honrath's *324
Tire, pneumatic 3
Tire and rim, bicycle *84
Tires, bicycle, paper 372
Tires, rubber, for ambulances 115
Tongues of birds 86
Tool, reloading, cartridge *228
Tools on locomotives 312
Toothpick industry 329
Torch, magnesium *218
Torpedo boat, aluminum 283
Torpedo boat Boxer 108
Torpedo boat destroyers, cost 251
Torpedo boat for the Maine *576
Torpedo boats, coal consumpt 314
Torpedo boats for the Maine *1
Torpedo boats, U. S., new 260
Torpedo boats in war 184
Torpedo catcher, fast 261
Torpedo catchers, new 178
Torpedo placer, Seamand's *295
Towage, canal, electric 380
Town, rural, fate of 293
Trade marks, German 34, 103
Traffic, passenger, Atlantic 115
Train robbers, to repel 133
Trains, armored 182
Trains, express, English 290
Tramway, aerial, Niagara 178
Tramway, electric, Rome 293
Tramway, wire rope 163
Tramways, electric 3, 169
Transit, rapid, in St. Louis 65
Transparencies 27, 313
Transparencies, collodio-chlo 298
Trap, steam *405
Traveling, fast 118
Tray, paper 117
Tree, giant *91
Tree, the traveler's 138
Trees, funeral, Indian 199
Trees, leafless 395
Tricycle, advertising *120
Tricycle, gasengine *25
Tricycle, petroleum *360
Tricycle steam *177
Trolley car lines, accidents 146
Trolley cars, palace 67
Trolley postal service 28
Trolley in Rome 293
Trolley telephone 66
Troops, Japanese
Truants of New York City 378
Truck, car, Esterley's *388
Truck, logging *21
Tuberculosis of cattle 212
Tube, speaking, electric *388
Tubes, pneumatic, frozen 244
Tunnel under Baltimore 92
Tunnel, Jeddo 149
Tunnels, stern, of Olympia 226
Typewriter, Dougherty *357
Typewriter and ribbon industry 108
Typewriters, speed of 235
Typhoid from oysters 7

U

United States, history of 390
United States, progress of 363
University, Purdue *292

V

Vaccination, animal 242
Vaccination, people without 168
Valve, balanced *164
Valve gear, electric *138
Vander Weyde, P. H. *197
Vanil a bean, the 28
Vault, light, Clopp's *52
Vault, New York Clearing House 403
Veneer press *196
Ventilating school rooms 217
Victoria regia in New Jersey *361
Village, the deserted 306
Vinegar, white *181
Vio in playing, curiosity 246
Violin, Woolenhaupt *88
Voice, the American 59
Volcano, eruption of a 140
Volcano, submarine 203
Volcanoes, African 7
Voting by machinery 371

W

Wagon tongue support *212
Wall paper, arsenical, test 388
War between Japan and China *105
War, China-Japanese 379
War, Japanese electric appli 291
War, Japanese, medical asp 230
War ship, Russian 133
War ship, Spanish, loss 235
War ship Terrible *392
War ships, Chinese, repairing *57
War ships, lighting 371
War ships, modern 117
War ships Texas and Oregon *32
Wash bottle, chemist's *5
Washing compounds 164
Waste for oiling cars 119
Watch, bicycle and holder *308
Watch schools, Swiss 227
Watches, curious *37
Watches, demagnetization 268
Water 134
Water closets, frozen 151
Waterconsumption, New York 296
Water motor, Rathbun's *293
Water motor, Weed *155
Water pipe trouble 98
Water power 395
Water, purification of 118
Water raising by com. air 307
Water, salt, filter 394
Water, salt, made potable 188
Water supply, DeKalb *401
Water supply of Rome 84
Waves 197
Waves, ocean, height of 261
Wax in cotton and linen fiber 323
Weather and the mind 179
Weather, zero, United States 98
Weaving, great invention in 306
Webster, Daniel, on the West 323
Welding rail joints *100
Well boring machinery 88
Whalebone, artificial 167
Wheat, average weight of 346
Wheel, how to ride 406
Wheel, riding a 137
Wheelman Lenz, search for 74
Wheelwoman, the French 372
Whistles, chime 362
Whistles, chime, for engines 308
Whooping cough, treatment 140
Windmill pump gear *36
Window cleaning accidents 294
Window glass, stained *345
Window for locomotive cabs 43
Winds, hot 150
Winds, hot, effects of 87
Wipers, silk waste 297
Women in Germany 23
Woman, inferiority of 188, 231, 263
Women, longevity of 5
Wood pulp 235
Wood stains 184
Wood, strength of 372
Woodpecker, boring *122
Woodworker, an old time 114
Wood wild waifiets 246
Wool scoured with naphtha 69
Wools, impurities of 107
Woolens, to make waterproof 226
Workingmen, injuries to 150
Wort, lead 404
Wrecks, raising 74
Wrench, convenient *103
Wrench, Delhommer's *342

Y

Yacht Defender *327
Yacht Giralda 7
Yachts, ice, new forms of 83
Yale, military science at 50
Yalu River, battle of 21

Z

Zinc to bleach molasses 60
Zinc, powdered, in photo. waste. 275

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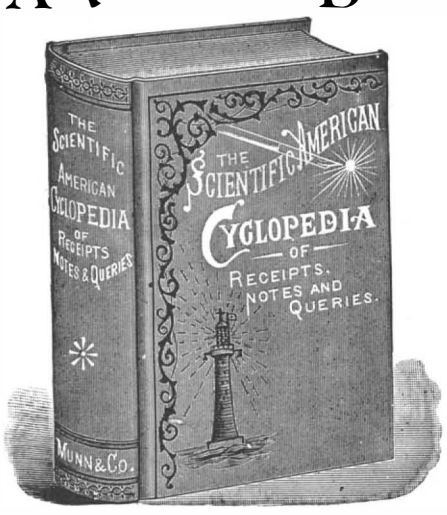

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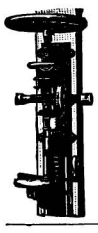

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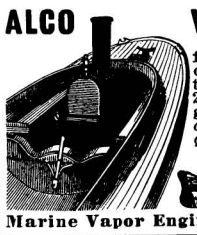

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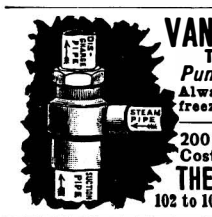

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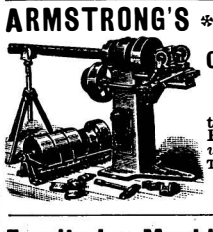

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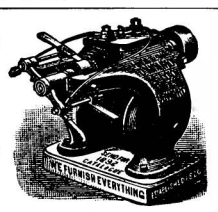

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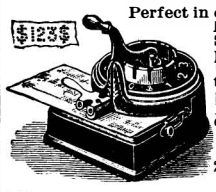

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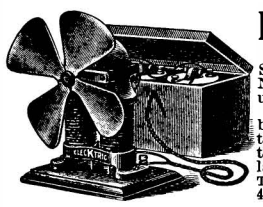

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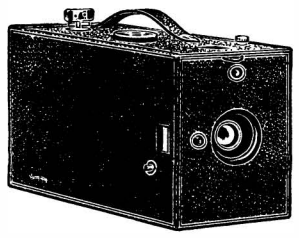

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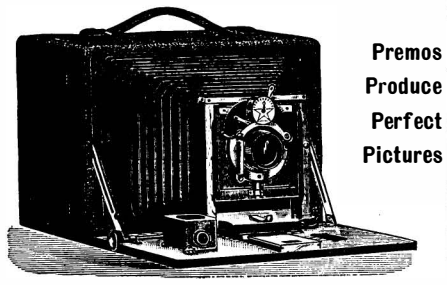

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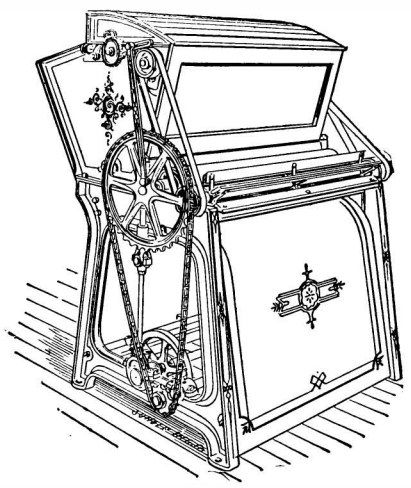

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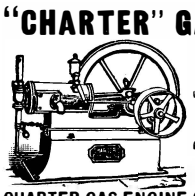

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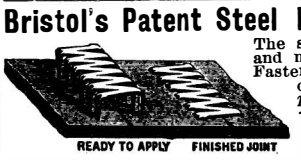

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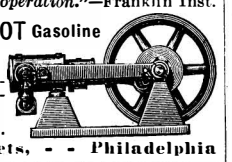

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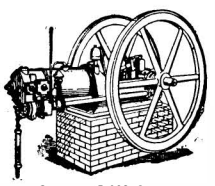

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